A technical manual from the experts in *Business-Critical Continuity™*

NetSure™ +24V DC Power System

Installation Instructions

IM581127000 (Issue AB, March 22, 2012)

SPEC. NO.	MODEL
581127000	710NPBA

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IMPORTANT SAFETY INSTRUCTIONS

GENERAL SAFETY

Danger: YOU MUST FOLLOW APPROVED SAFETY PROCEDURES.

Performing the following procedures may expose you to hazards. These procedures should be performed by qualified technicians familiar with the hazards associated with this type of equipment. These hazards may include shock, energy, and/or burns. To avoid these hazards:

a) The tasks should be performed in the order indicated.

b) Remove watches, rings, and other metal objects.

c) Prior to contacting any uninsulated surface or termination, use a voltmeter to verify that no voltage or the expected voltage is present.

d) Wear eye protection, and use recommended tools.

e) Use double insulated tools appropriately rated for the work to be performed.

Caution: Performing maintenance and/or troubleshooting procedures may interrupt power to the loads, if battery reserve is not sufficient.

VOLTAGES

AC Input Voltages

Danger: This system operates from AC voltage capable of producing fatal electrical shock. AC input power must be completely disconnected from the branch circuits wiring used to provide power to the system before any AC electrical connections are made. DO NOT apply AC power to the system until all electrical connections have been completed and checked.

DC Input/Output Voltages

Danger: This system produces DC Power and may require battery to be connected to it. Although the DC voltage is not hazardously high, the rectifiers and/or battery can deliver large amounts of current. Exercise extreme caution not to inadvertently contact or have any tool inadvertently contact a battery terminal or exposed wire connected to a battery terminal. NEVER allow a metal object, such as a tool, to contact more than one termination or battery terminal at a time, or to simultaneously contact a termination or battery terminal and a grounded object. Even a momentary short circuit can cause sparking, explosion, and injury.

BATTERY

Danger: Correct polarity must be observed when connecting battery leads.

Danger: Special safety precautions are required for procedures involving handling, installing, and servicing batteries. Observe all battery safety precautions in this manual and in the battery instruction manual. These precautions should be followed implicitly at all times. Remove watches, rings, and other metal objects before connecting battery leads.

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CIRCUIT CARD HANDLING

Warning: ***Installation or removal of the circuit cards requires careful handling. Before handling any circuit card, read and follow the instructions contained on the Static Warning Page.***

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STATIC WARNING

The printed circuit cards used in this equipment contain static sensitive components. The warnings listed below must be observed to prevent damage to these components. Disregarding any of these warnings may result in personal injury or damage to the equipment.

1. Strictly adhere to the procedures provided in this document.
2. Before touching any static sensitive component or printed circuit card containing such a component, discharge all static electricity from yourself by wearing a wrist strap grounded through a one megohm resistor. Some wrist straps, such as Emerson Network Power Part Number 631810600, have a built-in one megohm resistor; no external resistor is necessary. Read and follow wrist strap manufacturer's instructions outlining use of a specific wrist strap.
3. Do not touch the traces or components on a printed circuit card containing static sensitive components. Handle the printed circuit card only by the edges that do not have connector pads.
4. After removing a printed circuit card containing a static sensitive component, place the printed circuit card only on conductive or anti-static material such as conductive foam, conductive plastic, or aluminum foil. Do not use ordinary Styrofoam or ordinary plastic.
5. Store and ship static sensitive devices or printed circuit cards containing such components only in static shielding containers.
6. If necessary to repair a printed circuit card containing a static sensitive component, wear an appropriately grounded wrist strap, work on a conductive surface, use a grounded soldering iron, and use grounded test equipment.

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CHAPTER 1. GENERAL INFORMATION AND INSTALLATION CHECKLIST

CUSTOMER DOCUMENTATION PACKAGE

This document (IM581127000) provides *Installation Instructions* for NetSure™ Power System Model **710NPBA**, Spec. No. **581127000**.

The complete Customer Documentation Package consists of…

Bound System Installation Manual	
• Power System Installation Instructions:	IM581127000
• Power System Quick Start Guide:	QS581127000
Bound ACU+ Controller User Manual	
• ACU+ Controller User Instructions:	UM1M820BNA (includes instructions for 1M820DNA Controller)
USB Drive with All Customer Documentation	
• Power System Installation Instructions:	IM581127000
• Power System Quick Start Guide:	QS581127000
• Power System User Instructions:	UM581127000
• Power System "System Application Guide":	SAG581127000
• Power Data Sheet:	PD588705200 (PD588705201, PD588705202, PD588705203, PD588705204)
• Rectifier Instructions:	UM1R243000
• Converter Instructions:	UM1C24481500
• Engineering Drawings	
• Also provided on the USB drive is an ACU+ configuration drawing and the ACU+ configuration files loaded into the ACU+ as shipped.	

INSTALLATION ACCEPTANCE CHECKLIST

Provided below is an Installation Acceptance Checklist. This checklist helps ensure proper installation and initial operation of the system. As the procedures presented in Chapters 2 through 5 of this document are completed, check the appropriate box on this list. If the procedure is not required to be performed for your installation site, also check the box in this list to indicate that the procedure was read. When installation is done, ensure that each block in this list has been checked. Some of these procedures may have been factory performed for you.

Note: *The system is not powered up until the end of this checklist.*

Note: *Some of these procedures may have been performed at the factory for you.*

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Chapter 2. Installing the System

- ❑ Relay Rack Secured to Floor
- ❑ System Components Mounted in Relay Rack (if required)
- ❑ Optional Lug Adapter Busbar Kits Installed
- ❑ Circuit Breakers Installed
- ❑ Fuses Installed

Chapter 3. Setting Jumper and Switch Options

- ❑ Jumpers on System Interface Circuit Card Set
- ❑ Switch Setting on IB2 Interface Board Set
- ❑ Switch Setting on Optional EIB Interface Board Set
- ❑ Switch Setting on Optional SM-DU+ Set

Chapter 4. Making Electrical Connections

- ❑ Relay Rack Grounding Connection (Frame Ground) Made
- ❑ AC Input and AC Input Equipment Grounding Connections Made
- ❑ External Alarm, Reference, Monitoring, and Control Connections Made
- ❑ Ethernet Connection Made (if required)
- ❑ Load Connections Made
- ❑ Battery Connections Made
  - ❑ Batteries Installed and Connected in an optional Battery Tray (if furnished)
  - ❑ Optional Battery Tray Front Battery Covers Installed (if furnished)
  - ❑ Optional Battery Tray Circuit Breaker Guards Installed (if furnished)

Chapter 5. Installing the Modules and Initially Starting the System

- ❑ Rectifier and Converter Modules Installed
- ❑ System Started, Configured, and Checked

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CHAPTER 2.
INSTALLING THE SYSTEM

GENERAL REQUIREMENTS

- This product is intended only for installation in a Restricted Access Location on or above a non-combustible surface.
- This product must be located in a Controlled Environment with access to Crafts persons only.
- This product is intended for installation in Network Telecommunication Facilities (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- This product is intended for connection to the common bonding network in a Network Telecommunication Facility (CO, vault, hut, or other environmentally controlled electronic equipment enclosure).
- The installer should be familiar with the installation requirements and techniques to be used in securing the relay rack to the floor.
- Clearance requirements are:
  a) Recommended minimum aisle space clearance for the front of the relay rack is 2' 6".
  b) Recommended minimum aisle space clearance for the rear of the relay rack is 2’ 0” for any of the following conditions:
     1) Addition of a Module Mounting Assembly in the field.
     2) Making AC input connections to the field expansion Module Mounting Assembly.

  For all other conditions, recommended minimum aisle space clearance for the rear of the relay rack is that which is specified for proper module mounting assembly ventilation. Refer to Module Mounting Assembly Power Data Sheet PD588705200 (PD588705201, PD588705202, PD588705203, PD588705204) for ventilation spacing requirements.

  Note: *Minimum spacing specified for ventilation may not permit replacement of certain components such as module mounting shelves.*

SECURING THE RELAY RACK TO THE FLOOR

All equipment cabinets are factory mounted to the relay rack or shipping brackets specified when ordered.

Secure the relay rack to the floor per site requirements. Refer to the *General Requirements* section at the beginning of this chapter.

Ventilation Requirements

Refer to the *General Requirements* section at the beginning of this chapter.

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Relay Rack Floor Mounting Dimensions

Refer to Figure 2-1 for relay rack floor mounting dimensions.

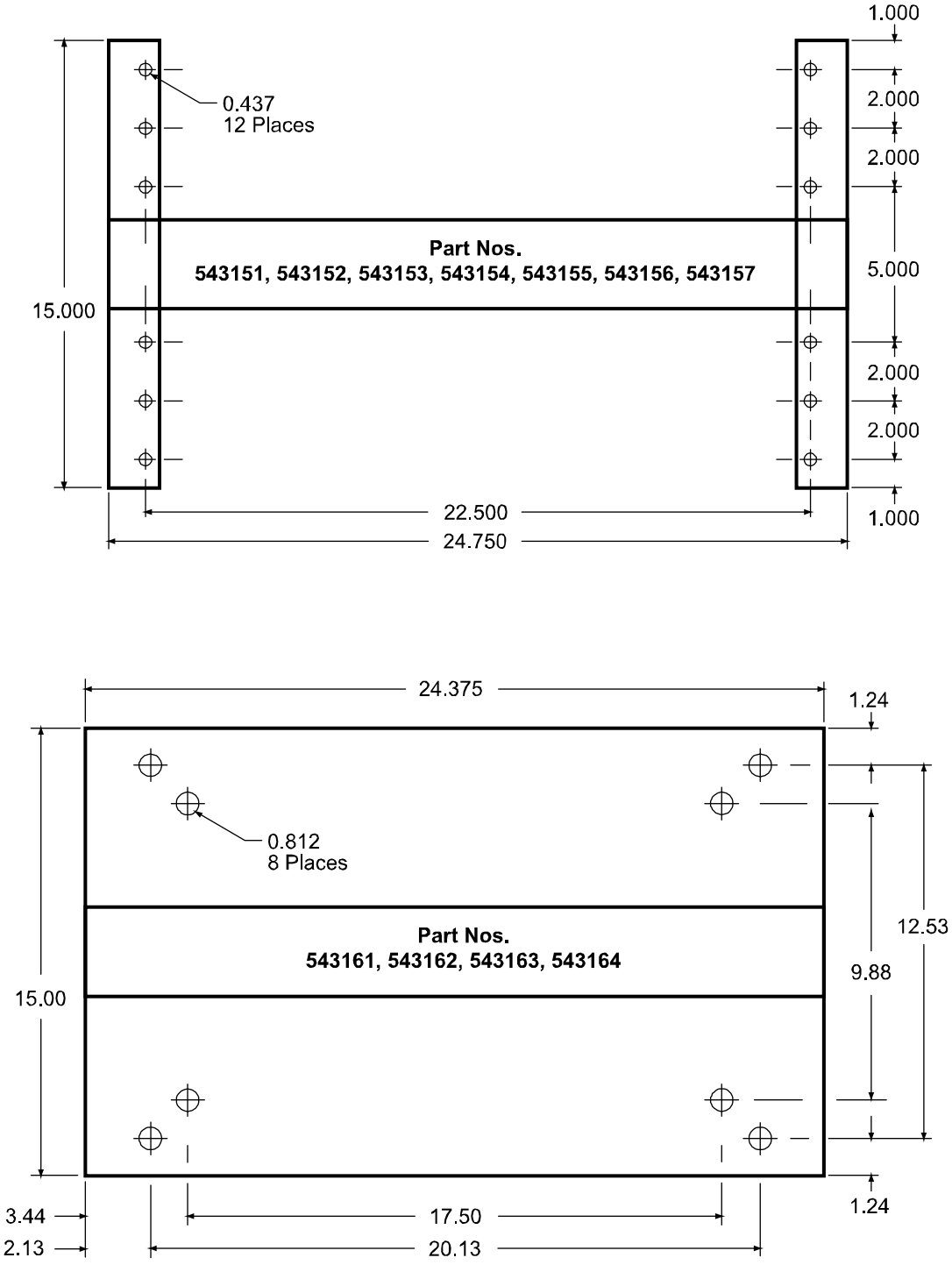

Figure 2-1 (cont'd on next page)
Relay Rack Floor Mounting Dimensions

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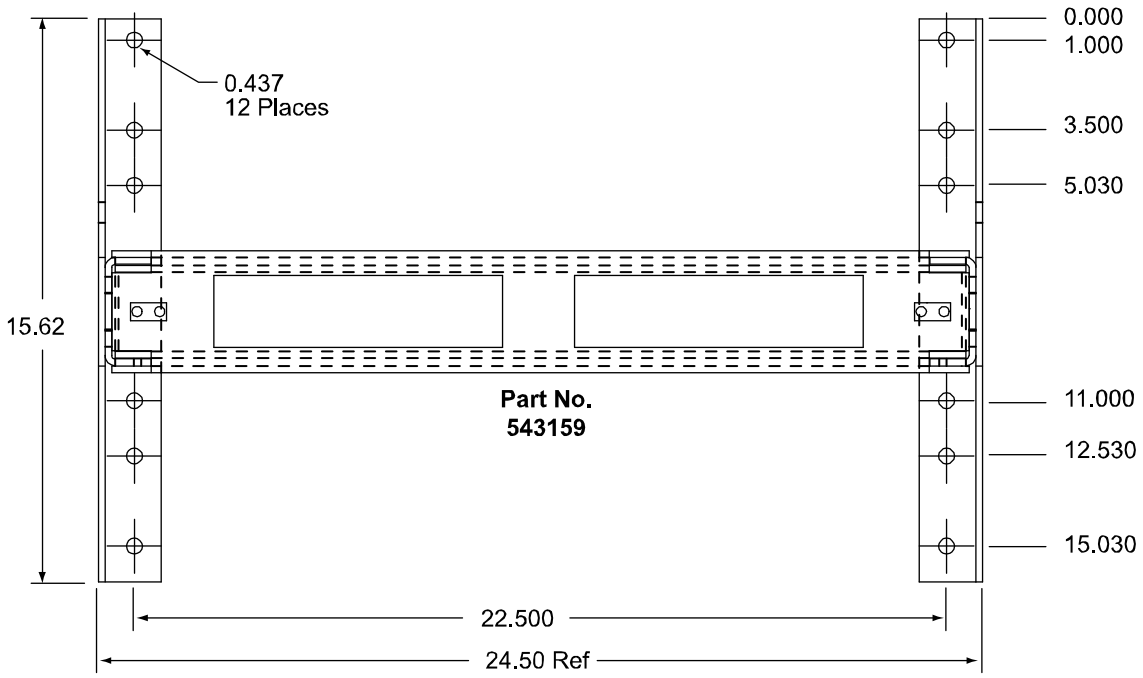

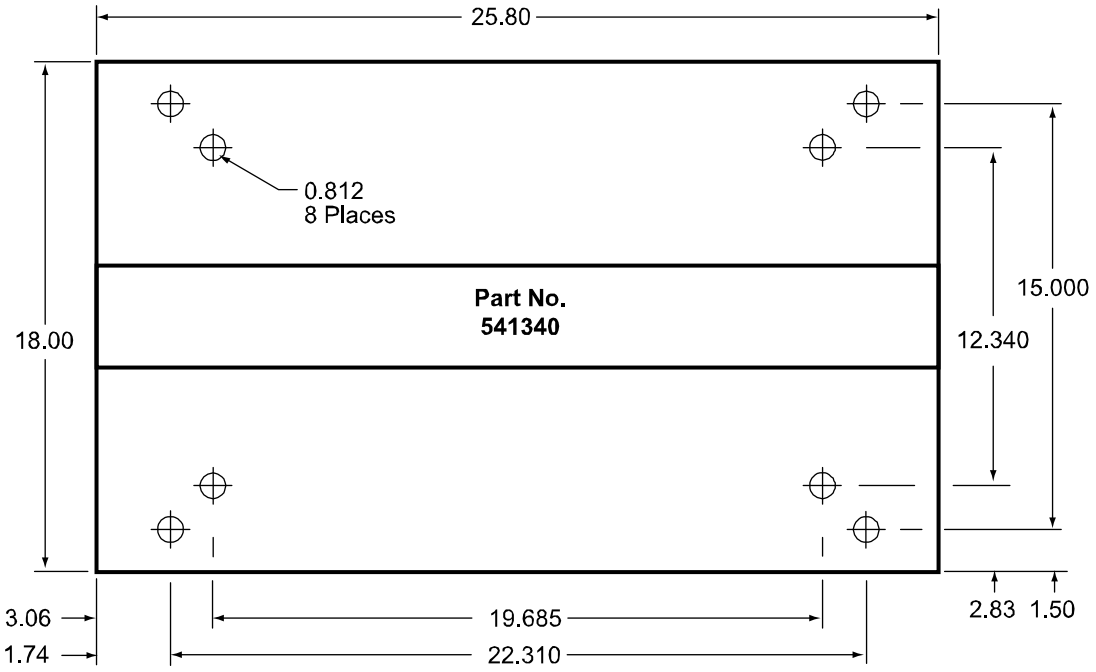

Figure 2-1 (cont'd from previous page, cont'd on next page)
Relay Rack Floor Mounting Dimensions

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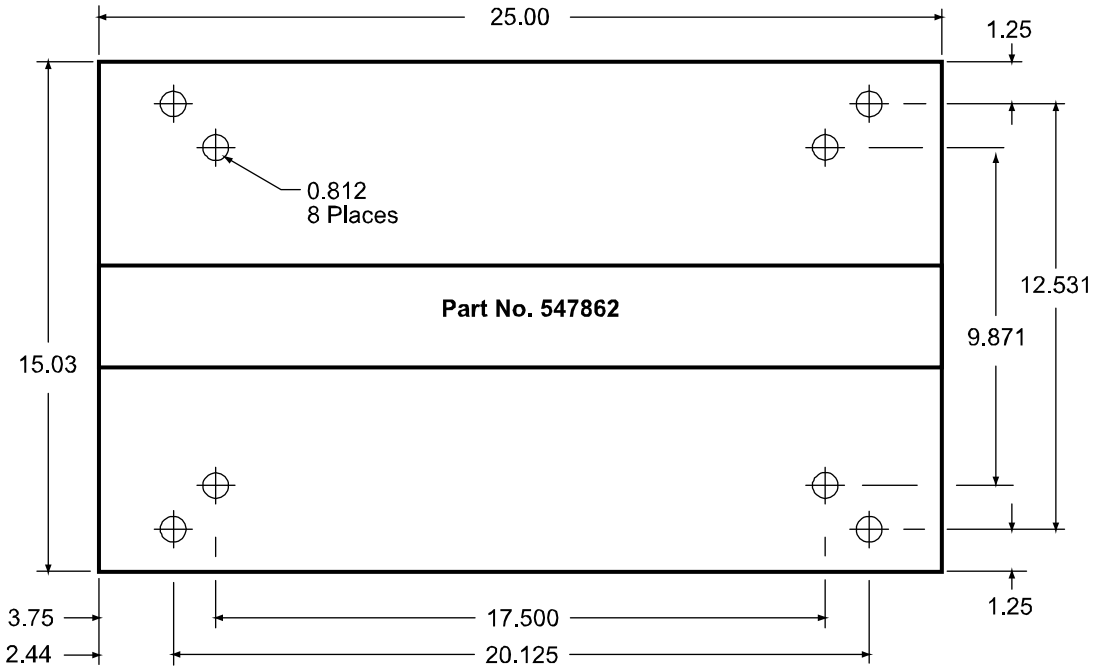

Figure 2-1 (cont'd from previous page)
Relay Rack Floor Mounting Dimensions

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MOUNTING SYSTEM COMPONENTS IN AN EQUIPMENT RACK

Note: *If the power system was ordered in a relay rack, these procedures have been performed at the factory.*

This power system is designed to mount in a standard 23" relay rack having 1" or 1-3/4" multiple drillings. Refer to System Application Guide SAG581127000 for overall dimensions and a list of available relay racks.

Mounting the Distribution Cabinet with Module Mounting Assembly

Note: *The distribution cabinet is factory connected to the module mounting assembly. The distribution cabinet with module mounting assembly is mounted as a complete assembly.*

The distribution cabinet with module mounting assembly must be the top-most component in the rack. Perform the following steps to mount the distribution cabinet with module mounting assembly.

Danger: ***The relay rack must be securely anchored to the floor before the distribution cabinet with module mounting assembly is installed.***

The distribution cabinet with module mounting assembly is heavy. Use a hoist, battery lift, or other appropriate lifting device to raise and support the assembly during the installation. Take appropriate precautions to avoid injury.

Procedure

1) Remove the distribution cabinet with module mounting assembly from its shipping brackets. Position the assembly in the equipment rack. Note that part of the AC wireways will have to be temporarily removed from the distribution cabinet to access the mounting hardware.

Note: *Install the ground washers so the teeth dig into the paint on the mounting angles. Torque all screws to 65 in-lbs.*

2) Mount the distribution cabinet to the relay rack using the following hardware. Refer to Figure 2-2.

   a) **1-Row Cabinet:** Install (8) 12-24 x 1/2" hex head thread-forming screws (P/N 218710500) and (8) No. 12 ground washers (P/N 215640600).

   b) **2-Row Cabinet:** Install (10) 12-24 x 1/2" hex head thread-forming screws (P/N 218710500) and (8) No. 12 ground washers (P/N 215640600).

   c) **3-Row Cabinet:** Install (12) 12-24 x 1/2" hex head thread-forming screws (P/N 218710500) and (14) No. 12 ground washers (P/N 215640600).

   d) **4-Row Cabinet:** Install (16) 12-24 x 1/2" hex head thread-forming screws (P/N 218710500) and (16) No. 12 ground washers (P/N 215640600).

3) Mount the module mounting assembly to the relay rack using hardware as shown Figure 2-3.

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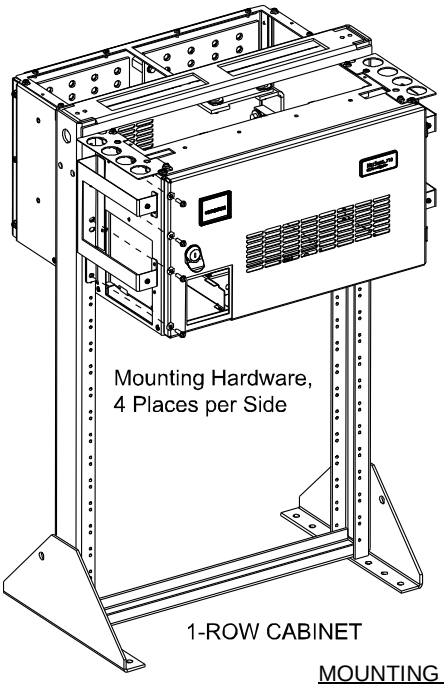
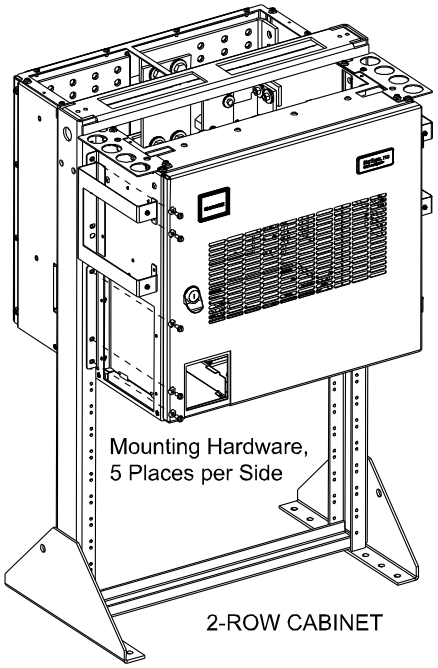
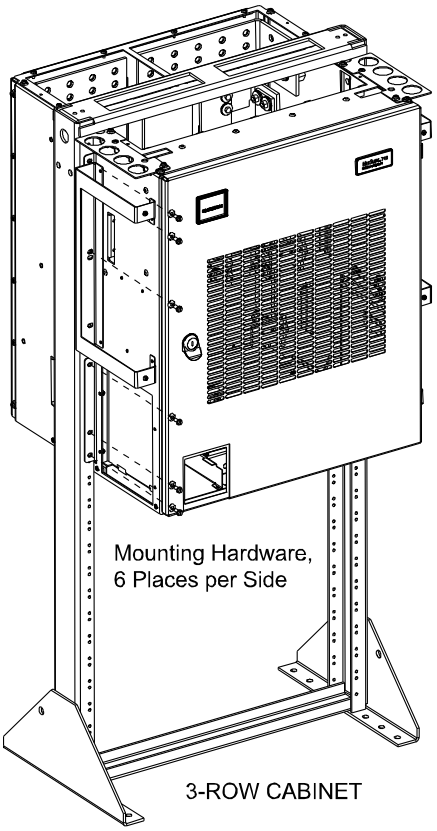




MOUNTING HARDWARE
12-24 X 1/2" THREAD FORMING HEX HEAD SCREW
NO. 12 GROUND WASHER

Module Mounting Shelf Assembly not shown for clarity only.



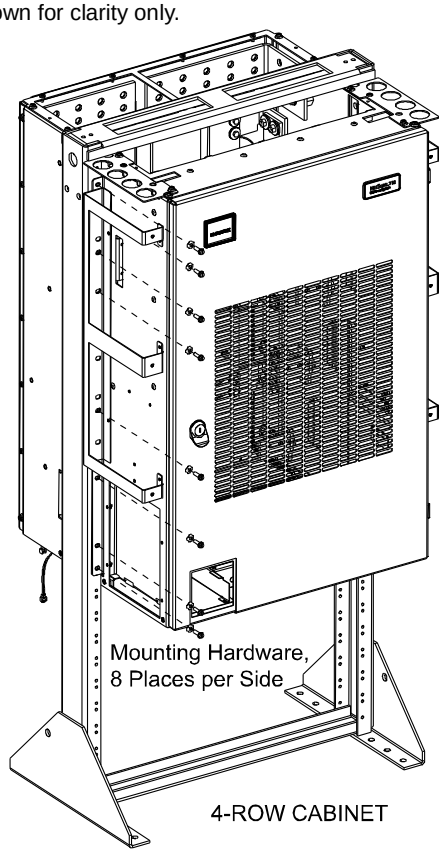


Figure 2-2
Distribution Cabinet Mounting Hardware View

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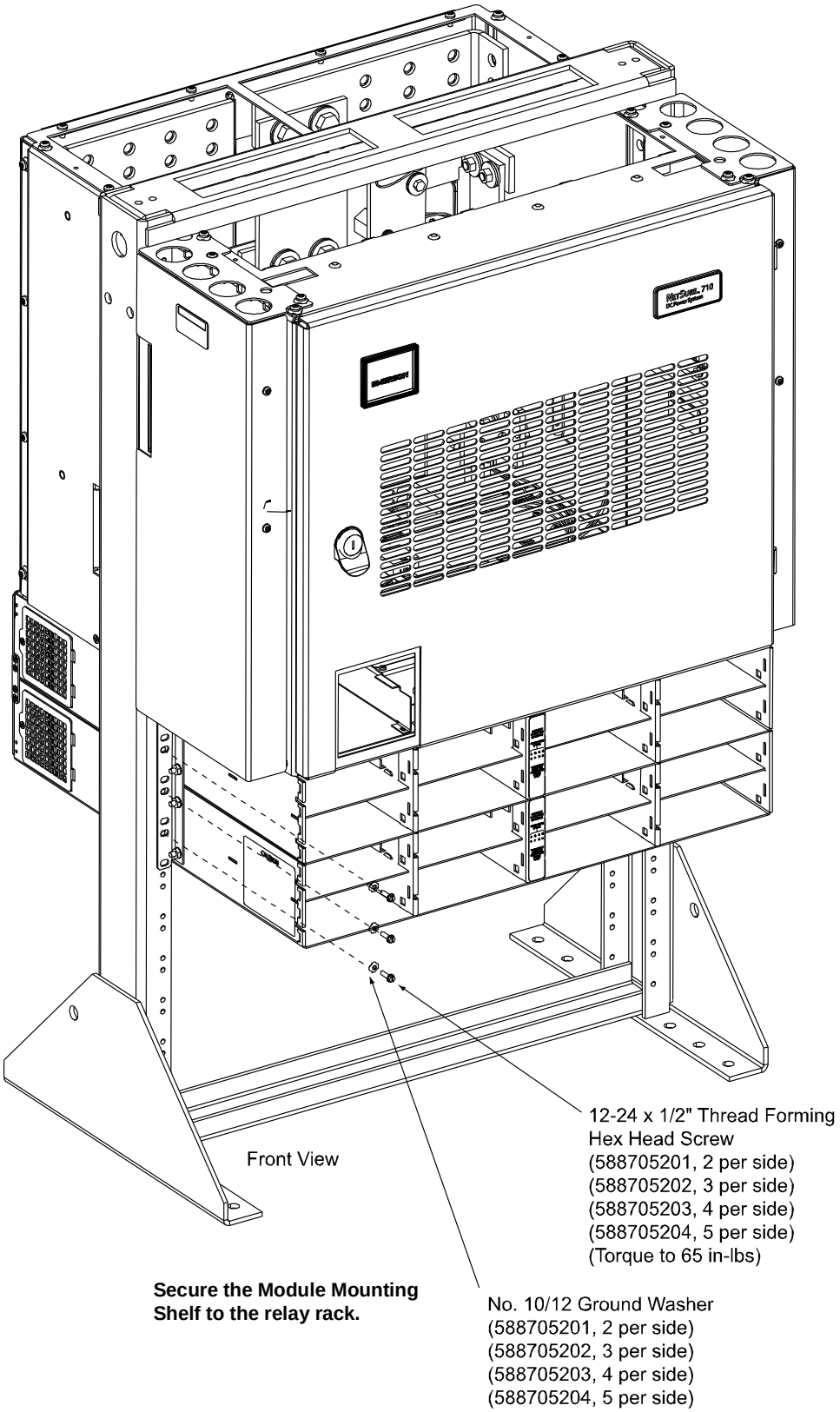
Front View
12-24 x 1/2" Thread Forming
Hex Head Screw
(588705201, 2 per side)
(588705202, 3 per side)
(588705203, 4 per side)
(588705204, 5 per side)
(Torque to 65 in-lbs)
Secure the Module Mounting Shelf to the relay rack.
No. 10/12 Ground Washer
(588705201, 2 per side)
(588705202, 3 per side)
(588705203, 4 per side)
(588705204, 5 per side)

Figure 2-3
Module Mounting Assembly Mounting Hardware View

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Installing a List 93 Battery Tray

Perform the following procedures to install a List 93 Battery Tray.

Danger: The relay rack must be securely anchored to the floor before a battery tray is installed.

Installing a Battery Tray Procedure

1) To install a List 93 Battery Tray, perform the procedure in Figure 2-4.

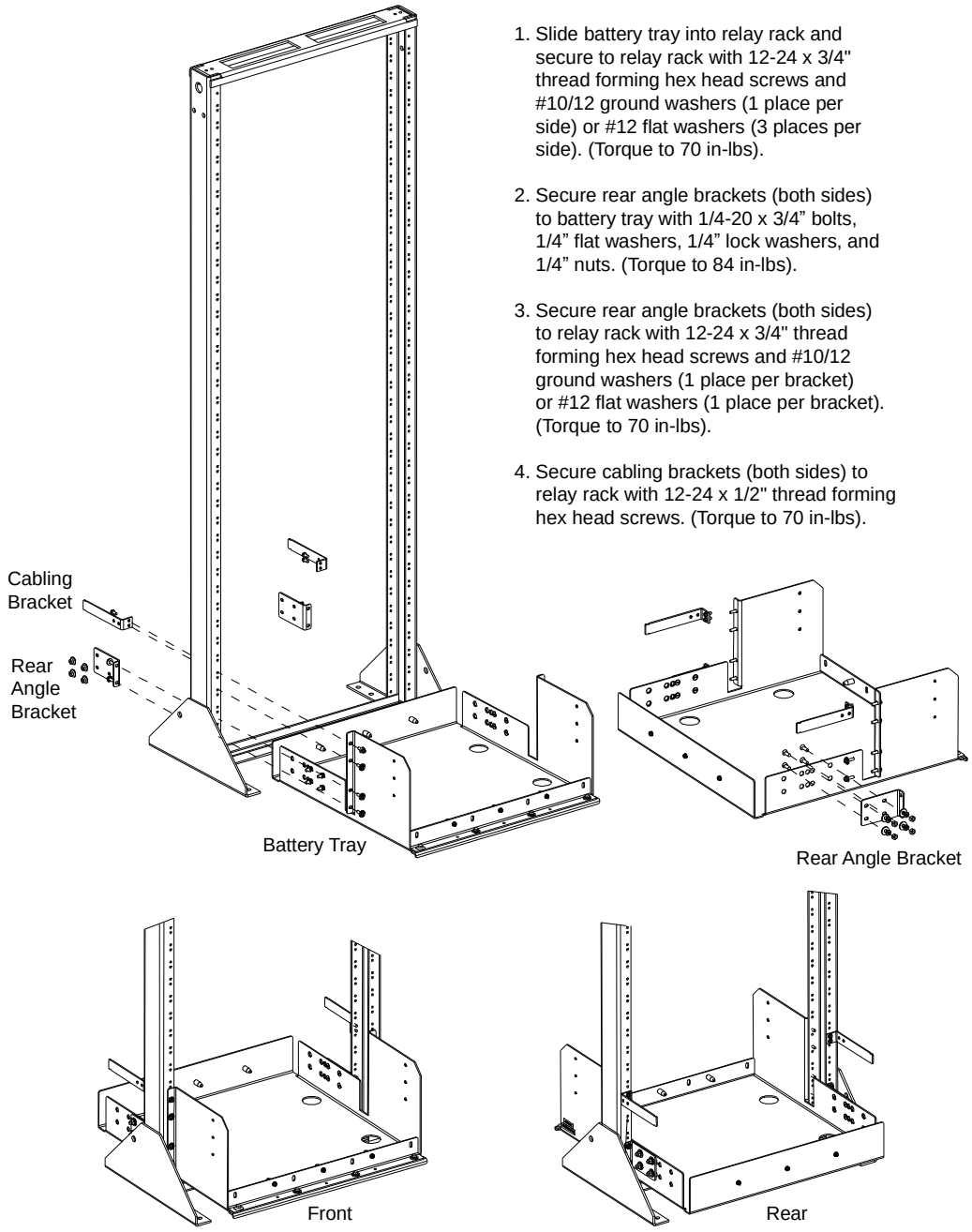
1. Slide battery tray into relay rack and secure to relay rack with 12-24 x 3/4" thread forming hex head screws and #10/12 ground washers (1 place per side) or #12 flat washers (3 places per side). (Torque to 70 in-lbs).
2. Secure rear angle brackets (both sides) to battery tray with 1/4-20 x 3/4” bolts, 1/4” flat washers, 1/4” lock washers, and 1/4” nuts. (Torque to 84 in-lbs).
3. Secure rear angle brackets (both sides) to relay rack with 12-24 x 3/4" thread forming hex head screws and #10/12 ground washers (1 place per bracket) or #12 flat washers (1 place per bracket). (Torque to 70 in-lbs).
4. Secure cabling brackets (both sides) to relay rack with 12-24 x 1/2" thread forming hex head screws. (Torque to 70 in-lbs).
Cabling Bracket
Rear Angle Bracket
Battery Tray
Rear Angle Bracket
Front
Rear

Figure 2-4
Installing a List 93 Battery Tray

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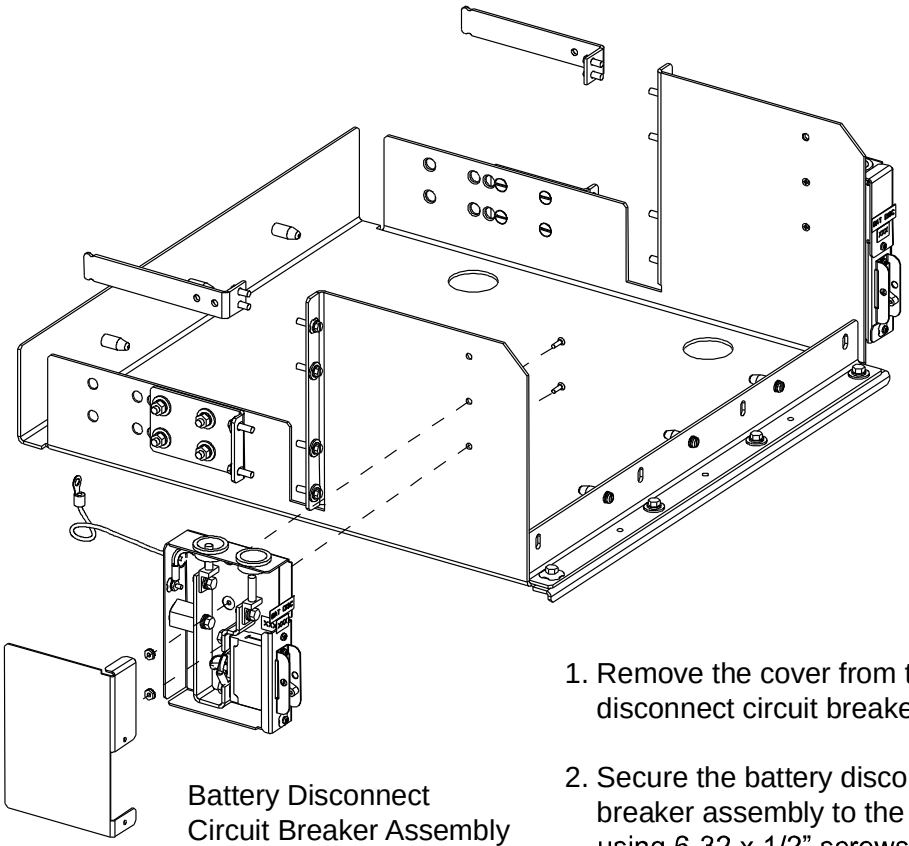
Installing Optional Battery Disconnect Circuit Breakers Procedure

1) To install optional battery disconnect circuit breakers onto the List 93 Battery Tray, perform the procedure in Figure 2-5.

2) Battery tray wiring is shown in "*Installing and Connecting Batteries in List 93 Battery Tray"* in *Chapter 4. Making Electrical Connections*.



Battery Disconnect
Circuit Breaker Assembly

1. Remove the cover from the battery disconnect circuit breaker assembly.
2. Secure the battery disconnect circuit breaker assembly to the battery tray using 6-32 x 1/2" screws and 6-32 KEPS nuts (2-places).
3. Secure the ground lead under a battery tray relay rack mounting bolt.
4. After wiring to the battery disconnect circuit breaker, replace the cover.
5. Repeat for the other side of the battery tray.

Figure 2-5
Installing Optional Battery Disconnect Circuit Breakers onto a List 93 Battery Tray

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Installing Optional Front Battery Cover Procedure

1) To install an optional front battery cover onto a List 93 Battery Tray, perform the procedure in Figure 2-6. Note that batteries must be installed first, as described in "*Installing and Connecting Batteries in List 93 Battery Tray"* in *Chapter 4. Making Electrical Connections.*

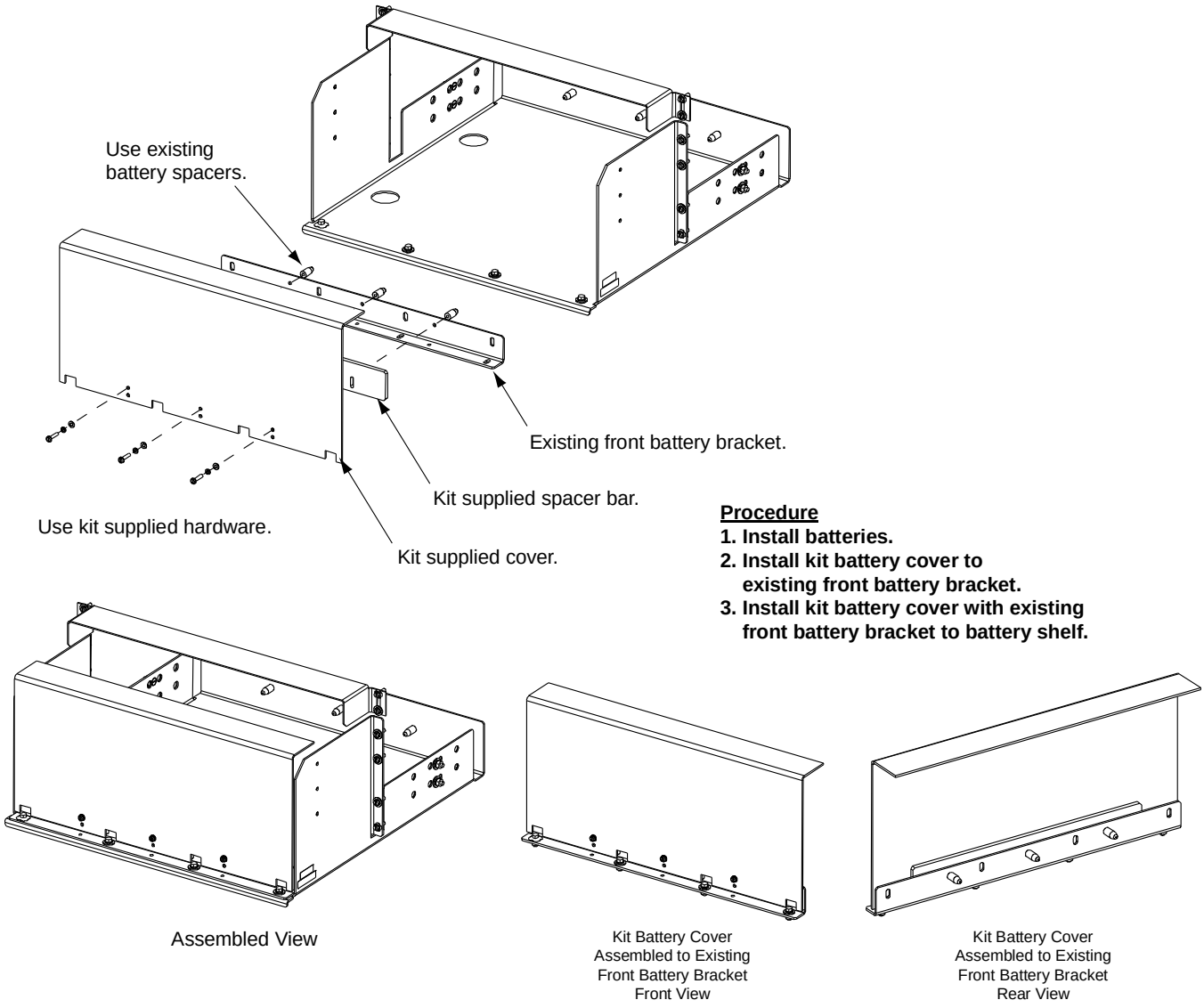
Use existing
battery spacers.
Existing front battery bracket.
Kit supplied spacer bar.
Use kit supplied hardware.
Kit supplied cover.
Procedure
1. Install batteries.
2. Install kit battery cover to existing front battery bracket.
3. Install kit battery cover with existing front battery bracket to battery shelf.
Assembled View
Kit Battery Cover Assembled to Existing Front Battery Bracket Front View
Kit Battery Cover Assembled to Existing Front Battery Bracket Rear View

Figure 2-6
Installing Optional Front Battery Cover onto a List 93 Battery Tray

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Installing Optional Circuit Breaker Guard Procedure

1) To install an optional circuit breaker guard onto a battery disconnect circuit breaker, perform the procedure in Figure 2-7.

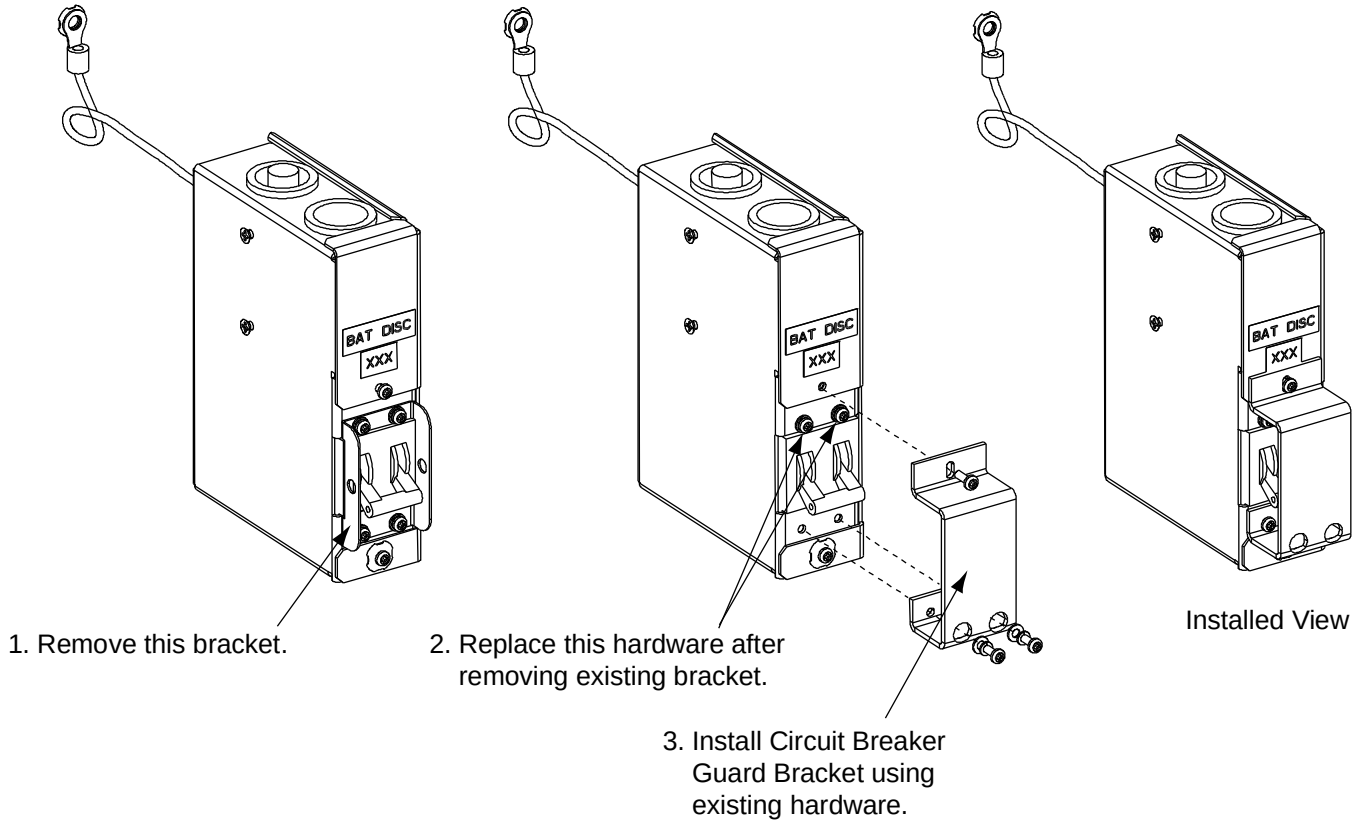

Figure 2-7
Installing Optional Circuit Breaker Guard

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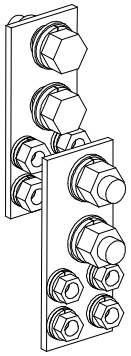
INSTALLING OPTIONAL LUG ADAPTER BUSBAR KITS, PART NOS. 534449 AND 514714

These kits provide lug adapter busbars plus hardware for use with 2-pole and 3-pole circuit breakers.

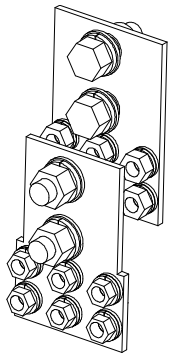
Contents of Kit P/N 534449 (for 2-pole circuit breakers)

Qty.	Part No.	Description
1	534447	Busbar
1	534448	Busbar
8	214110100	Flat Washer, 1/4”
4	214112100	Flat Washer, 3/8”
8	215111100	Lock Washer, 1/4”
4	215111300	Lock Washer, 3/8”
4	227640400	Hex Head Bolt, 1/4-20 x 3/4” (not used)
2	227646600	Hex Head Bolt, 3/8-16 x 1”
8	228557100	Nut, 1/4-20
2	228567100	Nut, 3/8-16



Contents of Kit P/N 514714 (for 3-pole circuit breakers)

Qty.	Part No.	Description
1	514676	Busbar
1	514678	Busbar
12	214110100	Flat Washer, 1/4”
4	214112100	Flat Washer, 3/8”
12	215111100	Lock Washer, 1/4”
4	215111300	Lock Washer, 3/8”
6	227640400	Hex Head Bolt, 1/4-20 x 3/4” (not used)
2	227646600	Hex Head Bolt, 3/8-16 x 1”
12	228557100	Nut, 1/4-20
2	228567100	Nut, 3/8-16



Procedure

Perform the following steps to install the lug adapter busbars. Refer to Figure 2-8 as the procedure is performed. Note also the restrictions on location in Figure 2-8.

1) Open the distribution cabinet’s front door by turning the latch in the counterclockwise position.
2) Install the lug adapter busbars as shown in Figure 2-8. Apply anti-oxidizing compound to busbar mating surfaces before assembling. Recommended torque is 72 in-lbs using the supplied 1/4” bolts and hardware.
3) Orient the load lug hardware as shown in Figure 2-8. Recommended torque is 300 in-lbs using the supplied 3/8” bolts and hardware.
4) Close the distribution cabinet’s front door. Turn the latch clockwise to secure the door.

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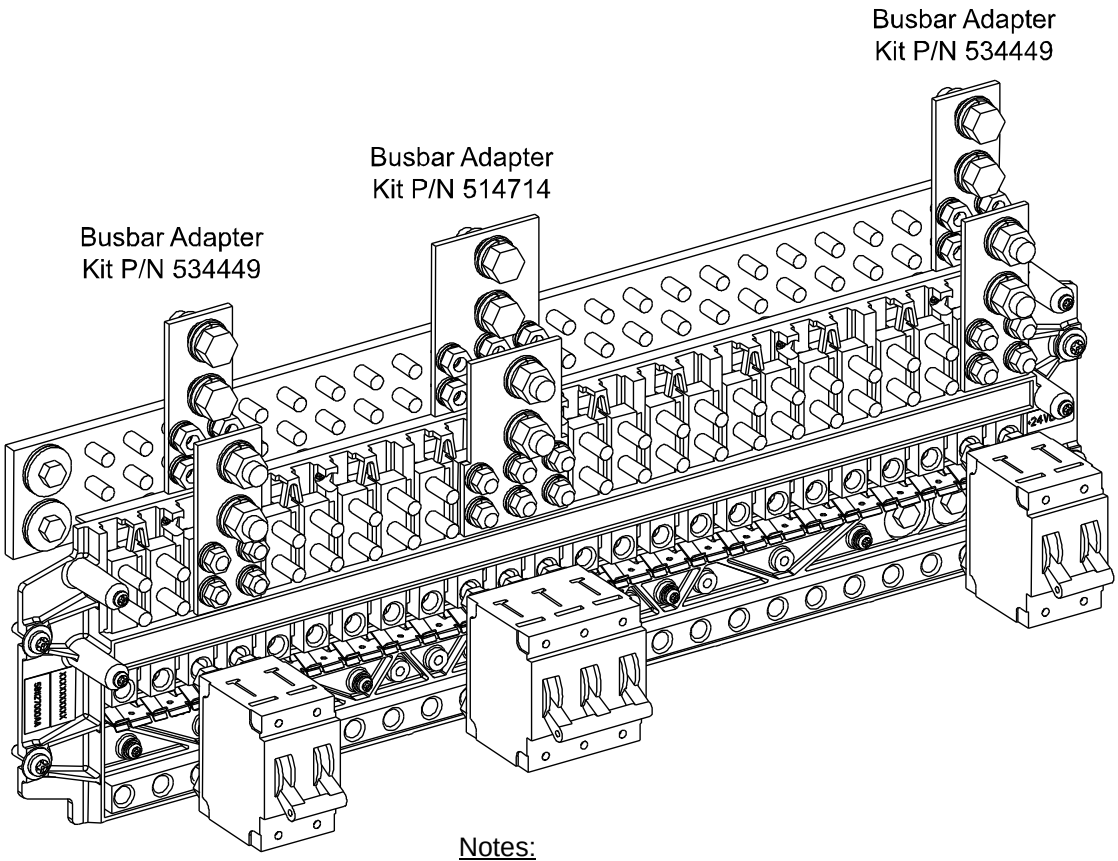

Notes:

Orient busbars as shown.

Shield not shown. Remove breakaway areas from shield as required. Breakaways are only provided for positions 1-8, 9-12, and 23-24. This restricts 2 and 3-pole breaker adapter kits to be located in these positions only.

Circuit breaker locations for reference only.

Figure 2-8
Installing Lug Adapter Busbar Kits

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INSTALLING CIRCUIT BREAKERS AND FUSES

Circuit breakers and/or fuses may have been factory installed for you. If so, verify their positions and sizes.

Installing Bullet Nose Type Fuseholders and TPS/TLS Fuses

Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

Refer to the following procedure and install bullet nose type fuseholders and appropriately sized TPS/TLS fuses into the proper mounting positions in the distribution cabinet.

Procedure

Note: *Refer to Figure 2-9 as this procedure is performed.*

1) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
2) Orient the fuseholder as shown in Figure 2-9. Insert the terminals on the rear of the fuseholder into their corresponding sockets on the distribution panel. Ensure the alarm contact on the back of the fuseholder makes contact with the alarm terminal on the mounting circuit card. Push fuseholder in firmly until fully seated in the distribution panel.
3) When all fuseholders are installed, install an appropriately sized TPS/TLS fuse in each. To do this, remove the fuse carrier from the mounted fuseholder body by pulling it straight out. Slide the fuse in place between the contacts of the fuse carrier. When done, push the fuse carrier back into the fuseholder body. Note that a polarizing key on the bottom of the carrier prevents the carrier from being inserted upside down.
4) Verify that an 18/100 ampere alarm fuse is present in each fuseholder and that a plastic safety cover is installed on this fuse.
5) Record all fuse sizes on the label provided on the shield.
6) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

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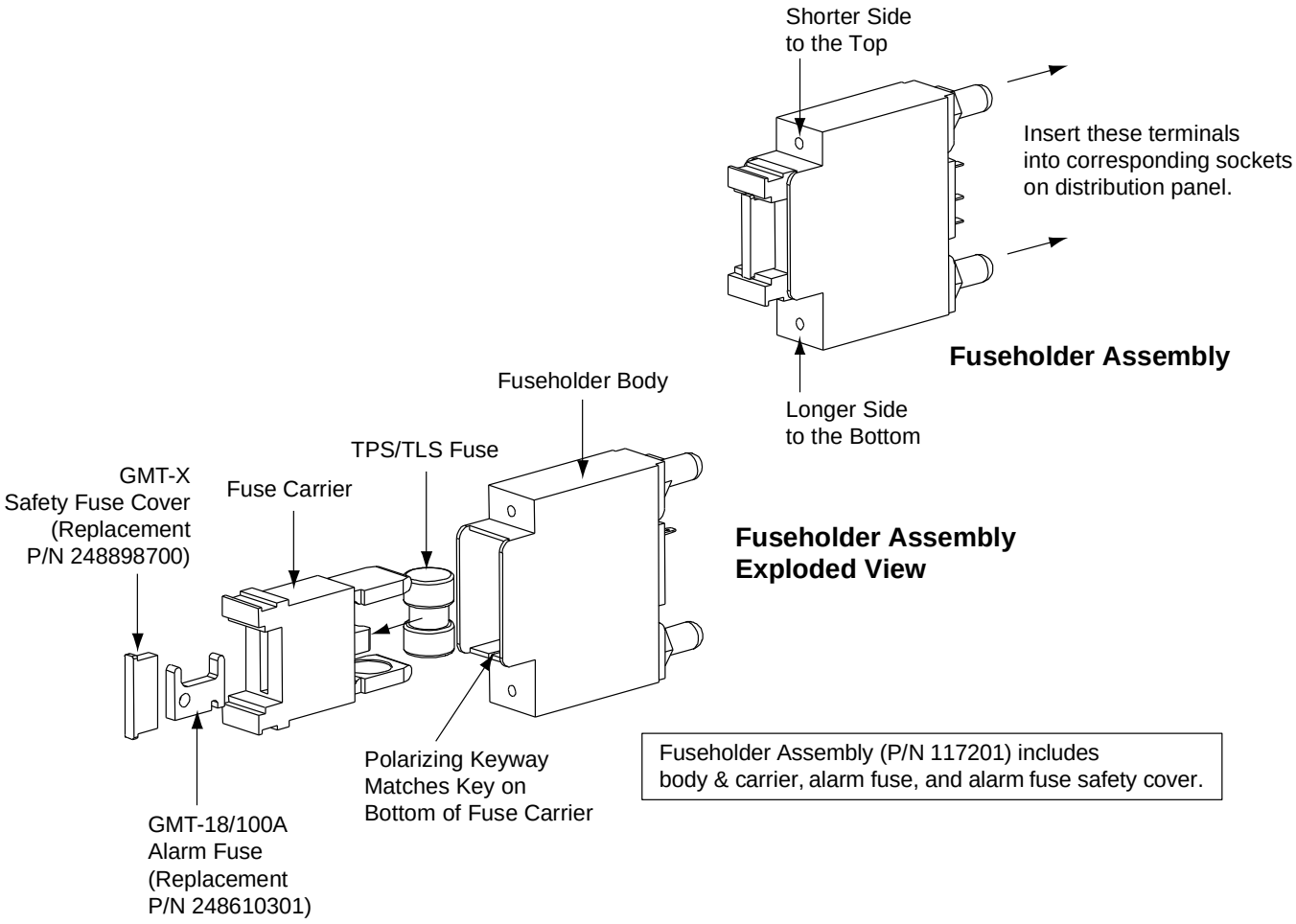

Figure 2-9
Installing a Bullet Nose Type Fuseholder and TPS/TLS Fuse

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Installing Bullet Nose Type Circuit Breakers

Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

Refer to the following procedure and install appropriately sized bullet nose type circuit breakers into the proper mounting positions in the distribution cabinet.

Procedure

Note: *Refer to Figure 2-10 as this procedure is performed.*

1) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
2) Ensure that the circuit breaker is in the OFF position and is of the correct rating. Orient the circuit breaker as shown in Figure 2-10. Insert the terminals on the rear of the circuit breaker into their corresponding sockets on the distribution panel. Ensure the alarm contact on the back of the circuit breaker makes contact with the alarm terminal on the mounting circuit card. Push distribution device in firmly until fully seated in the distribution panel.
3) Record all circuit breaker sizes on the label provided on the shield.
4) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

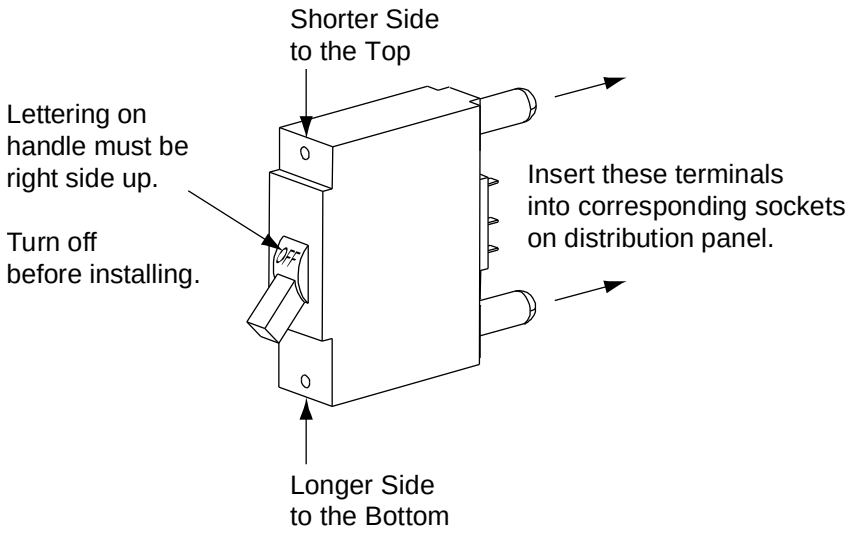

Figure 2-10
Installing a Bullet Nose Type Circuit Breaker

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Installing an Optional Bullet Nose Type 6-Position GMT Distribution Fuse Block

Note: *Refer to Figure 2-11 as this procedure is performed.*

Procedure

1) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
2) Follow the steps in Figure 2-11.
3) Install an appropriately sized GMT fuse in each fuse mounting position on the GMT Distribution Fuse Block as required. If dummy fuses are installed, first remove the dummy fuse.
   a) Verify that dummy fuses are installed in all unused fuse positions on the GMT distribution fuse block.
   b) Verify that a plastic safety cover is installed on all GMT fuses on the GMT distribution fuse block.
4) Record all fuse sizes (installed on the GMT distribution fuse block) on the label provided on the shield.
5) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

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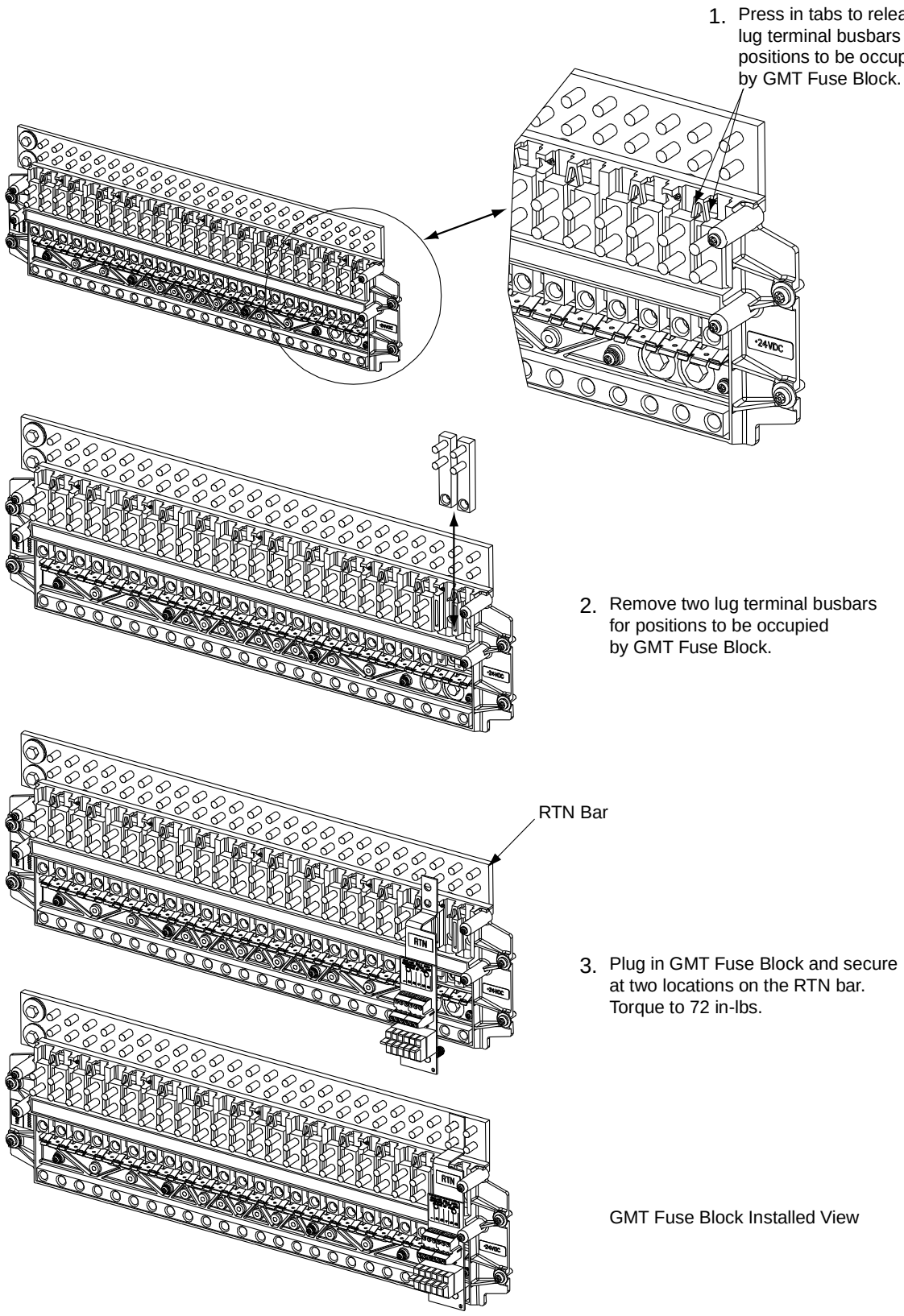
1. Press in tabs to release lug terminal busbars for positions to be occupied by GMT Fuse Block.
2. Remove two lug terminal busbars for positions to be occupied by GMT Fuse Block.
RTN Bar
3. Plug in GMT Fuse Block and secure at two locations on the RTN bar. Torque to 72 in-lbs.
GMT Fuse Block Installed View
RTN
+24VDC

Figure 2-11
Installing an Optional Bullet Nose Type 6-Position GMT Distribution Fuse Block

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Installing TPH Fuses

Refer to the following procedure and install appropriately sized TPH fuses into the proper fuseholders in the distribution cabinet.

Procedure

Note: *Refer to Figure 2-12 as this procedure is performed.*

1) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
2) Remove the TPH fuse carrier from the mounted fuseholder body by grasping its handle and firmly pulling it straight out. Install the TPH fuse into the fuse carrier. When done, push the fuse carrier securely back into the mounted fuseholder body.
3) Verify that a 1/4 ampere alarm fuse is installed in the GMT-type fuseholder located adjacent to the TPH fuseholder and that a plastic safety cover is install on this fuse.
4) Record all fuse sizes on the cards provided within the fuseholders.
5) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

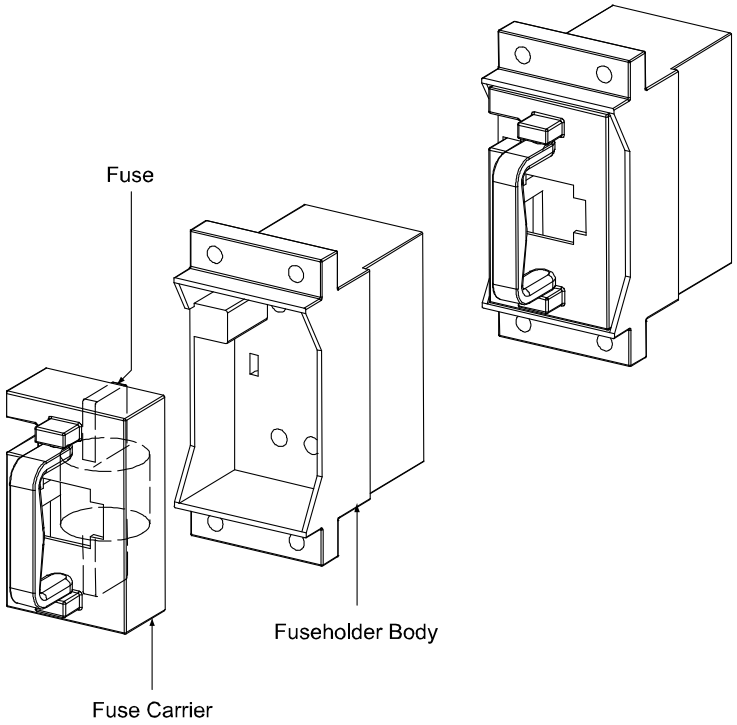

Figure 2-12
Installing a TPH Fuse

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Installing TPL-B Fuses

Refer to the following procedure and install appropriately sized TPL-B fuses into the proper fuseholders in the distribution cabinet.

Procedure

Note: *Refer to Figure 2-13 as this procedure is performed.*

1) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
2) Remove the fuse case from the mounted fuse block by grasping its handle and pulling it straight out.
3) Verify that an 18/100 ampere alarm fuse is present in the GMT-type fuseholder located on the fuse block and that a plastic safety cover is installed on this fuse.
4) Open the fuse case.
5) Install the TPL fuse into the fuse case.
6) Close the fuse case.
7) Firmly plug the fuse and fuse case into the fuse block.
8) Record all fuse sizes on the cards provided within the fuseholders.
9) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

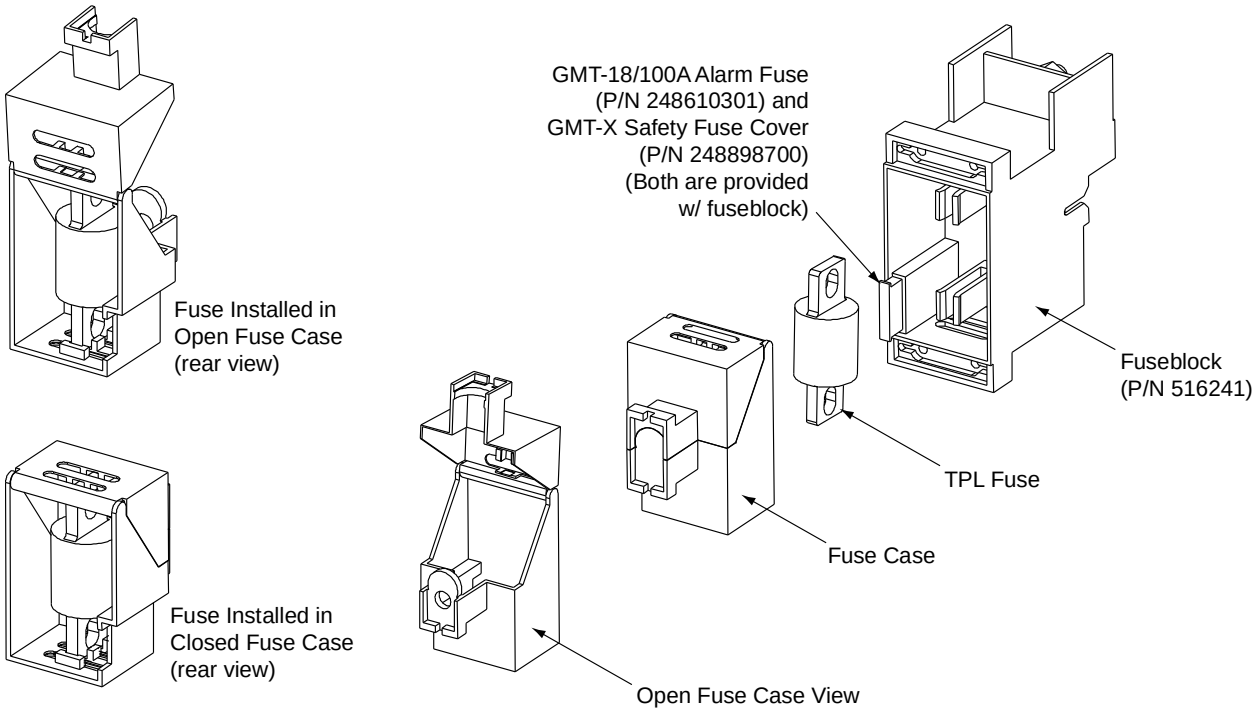

Figure 2-13
Installing TPL-B Fuses

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Installing GJ/218 Circuit Breakers

Refer to the following procedure and install appropriately sized GJ/218 circuit breakers into the proper mounting positions in the distribution cabinet.

Procedure

Note: *Refer to Figure 2-14 as this procedure is performed.*

1) Locate the appropriate circuit breaker mounting kit ordered with the circuit breaker. The circuit breaker mounting kit contains installation hardware, an alarm jumper, a shunt jumper (if applicable), a busbar (for 2- and 3-pole circuit breakers), and a circuit breaker guard. Refer to SAG581127000 for part numbers of the circuit breaker mounting kits.
2) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
3) Ensure that the circuit breaker is in the OFF position, and is of the correct rating and type (electrical trip/mechanical trip or electrical trip only). Apply anti-oxidizing compound to busbar mating surfaces on the distribution panel and the circuit breaker. Orient the circuit breaker over its mounting location.
    a) Attach the alarm jumper connectors to the back of the circuit breaker, then plug the other end of the alarm jumper into its corresponding connector. Wiring diagrams are provided in Figure 2-14 and at the end of this procedure.
    b) **Shunted Breakers Only:** Attach the shunt jumper connectors to the back of the circuit breaker, then route the jumper through the hole in the distribution panel. Wiring diagrams are provided in Figure 2-14, Figure 2-15, and Figure 2-16.

Danger: The bolts being installed in the following step may be at system potential. Use insulated tools.

4) Install the circuit breaker into its mounting position and secure with the provided hardware. Torque to 60 in-lbs.
5) Install the circuit breaker guard and label (refer to Figure 2-14).
6) **2-Pole and 3-Pole Circuit Breakers Only:** Install the mounting kit supplied busbar as shown in Figure 2-14. Torque to 180 in-lbs.
7) **Shunted Breakers Only:** Route and connect shunt leads to the SM-DU+ and Shunt Interface Assembly.
8) Record all circuit breaker sizes on the label provided on the shield.
9) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

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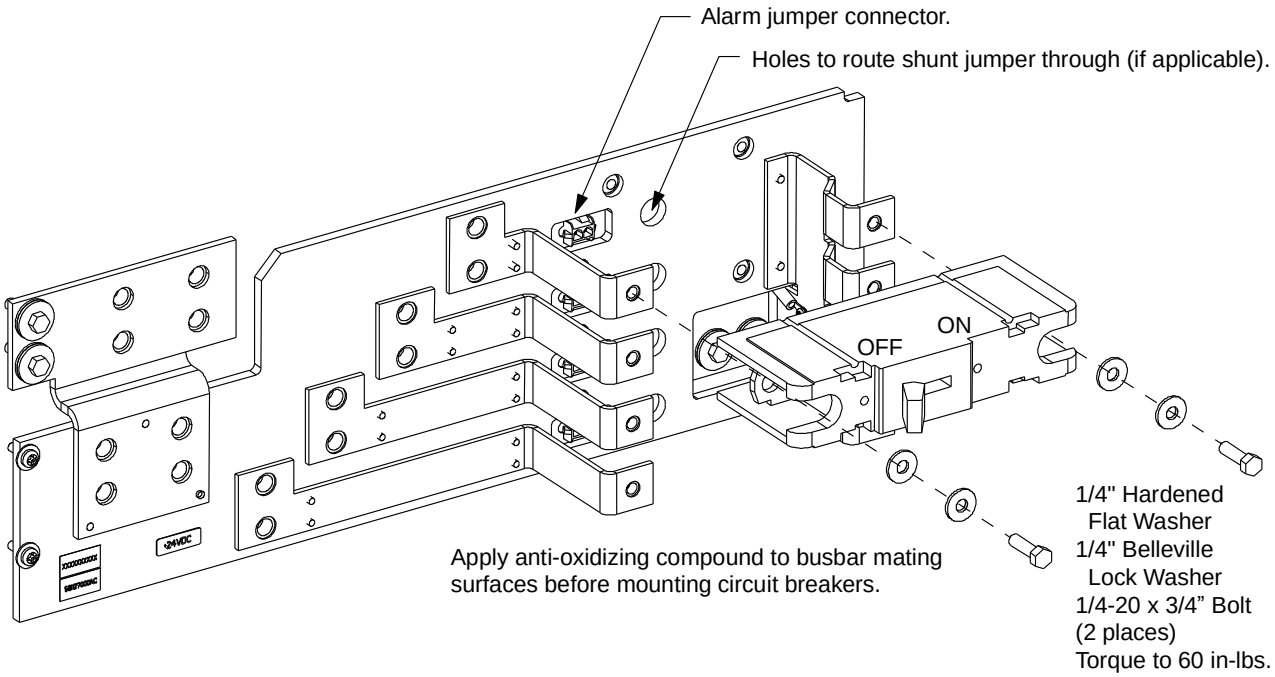
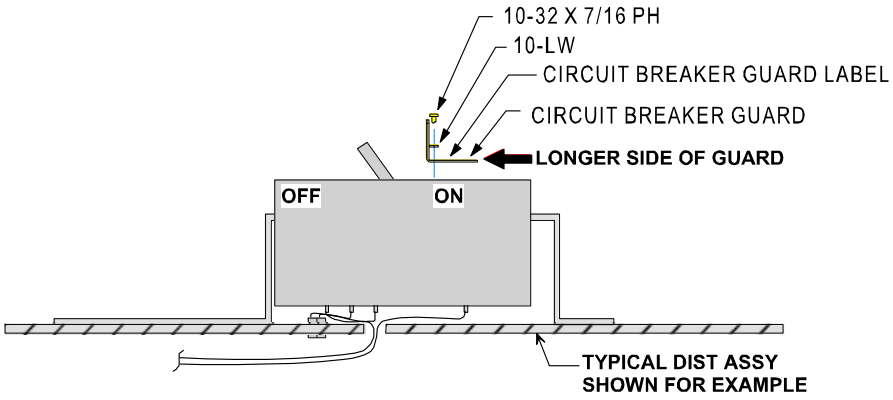
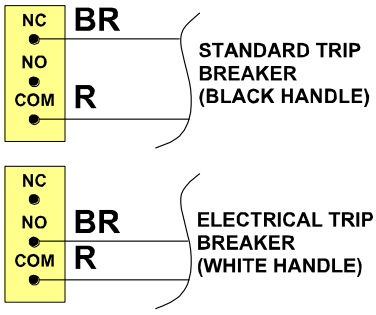
INSTALLING CIRCUIT BREAKER


Alarm jumper connector.
Holes to route shunt jumper through (if applicable).
ON
OFF
Apply anti-oxidizing compound to busbar mating surfaces before mounting circuit breakers.
1/4" Hardened Flat Washer
1/4" Belleville Lock Washer
1/4-20 x 3/4" Bolt (2 places)
Torque to 60 in-lbs.

INSTALLING CIRCUIT BREAKER GUARD



ALARM WIRING (BREAKERS W/OUT SHUNTS)



ALARM WIRING (BREAKERS WITH SHUNTS)

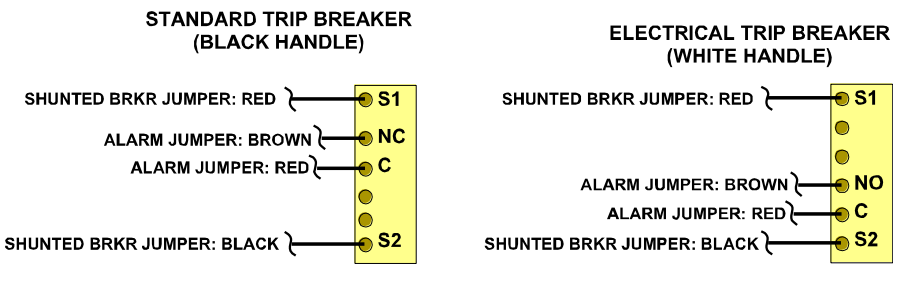


Figure 2-14 (cont'd on next page)
Installing a GJ/218 Circuit Breaker (1-Pole)

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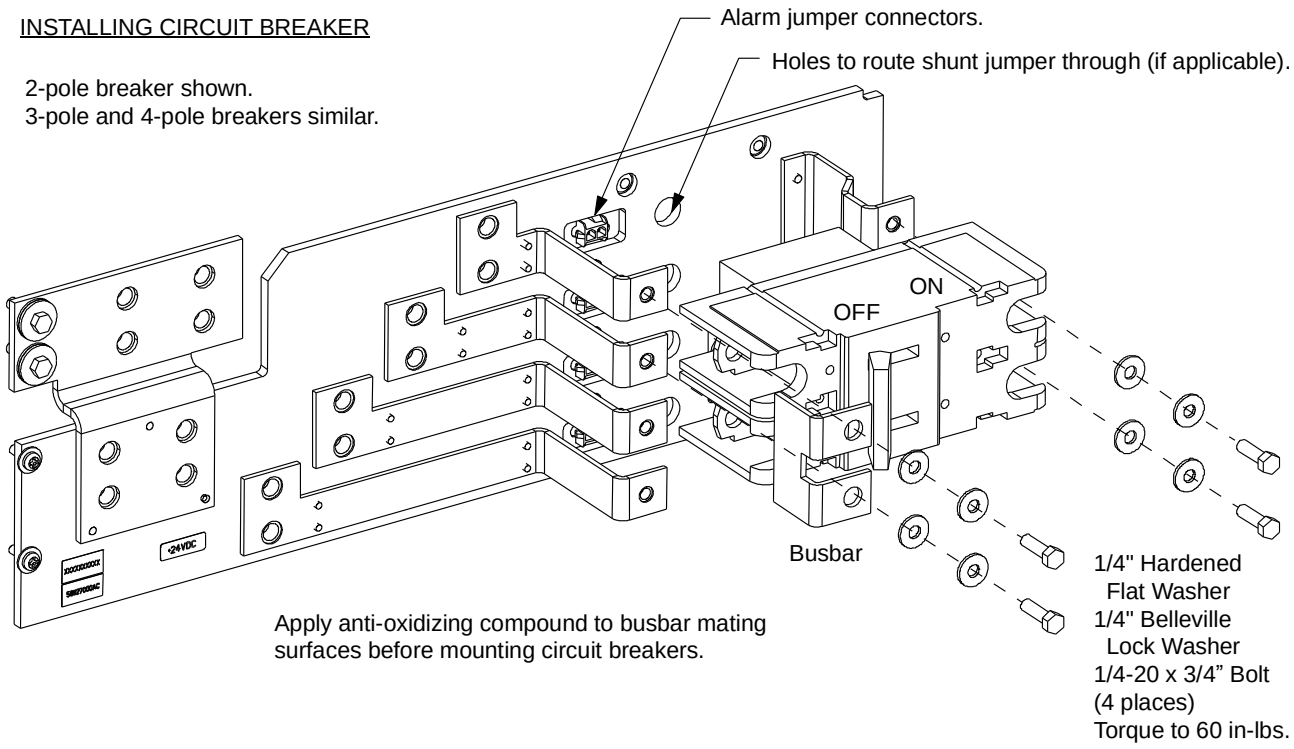
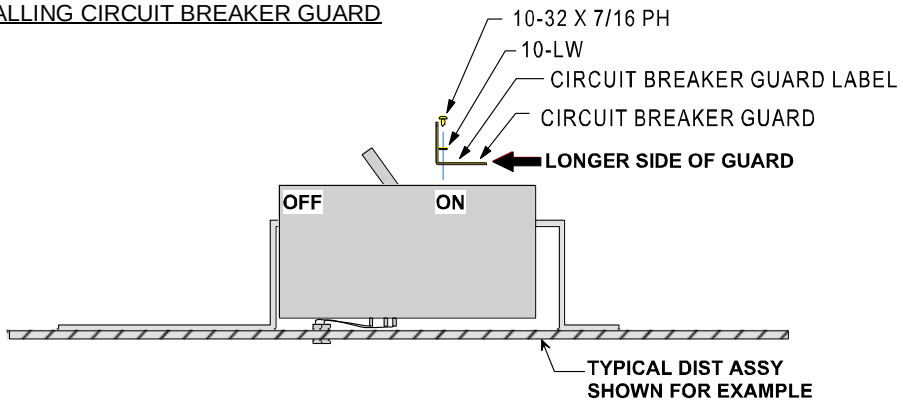
INSTALLING CIRCUIT BREAKER

2-pole breaker shown.
3-pole and 4-pole breakers similar.

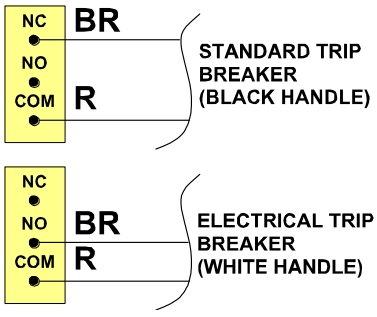


Apply anti-oxidizing compound to busbar mating surfaces before mounting circuit breakers.

INSTALLING CIRCUIT BREAKER GUARD



ALARM WIRING (BREAKERS W/OUT SHUNTS)



ALARM WIRING (BREAKERS WITH SHUNTS)

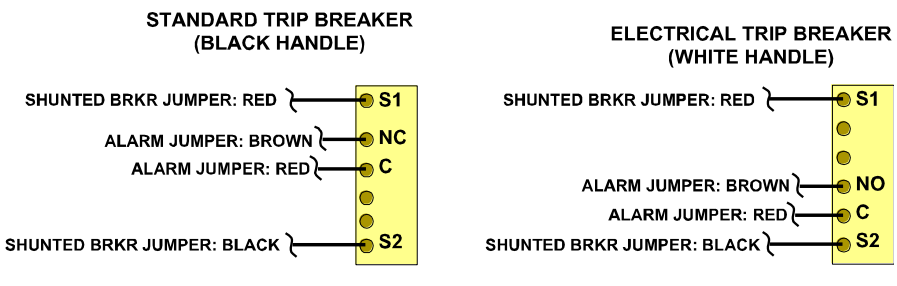


Figure 2-14 (cont'd from previous page)
Installing a GJ/218 Circuit Breaker (2-Pole, 3-Pole, 4-Pole)

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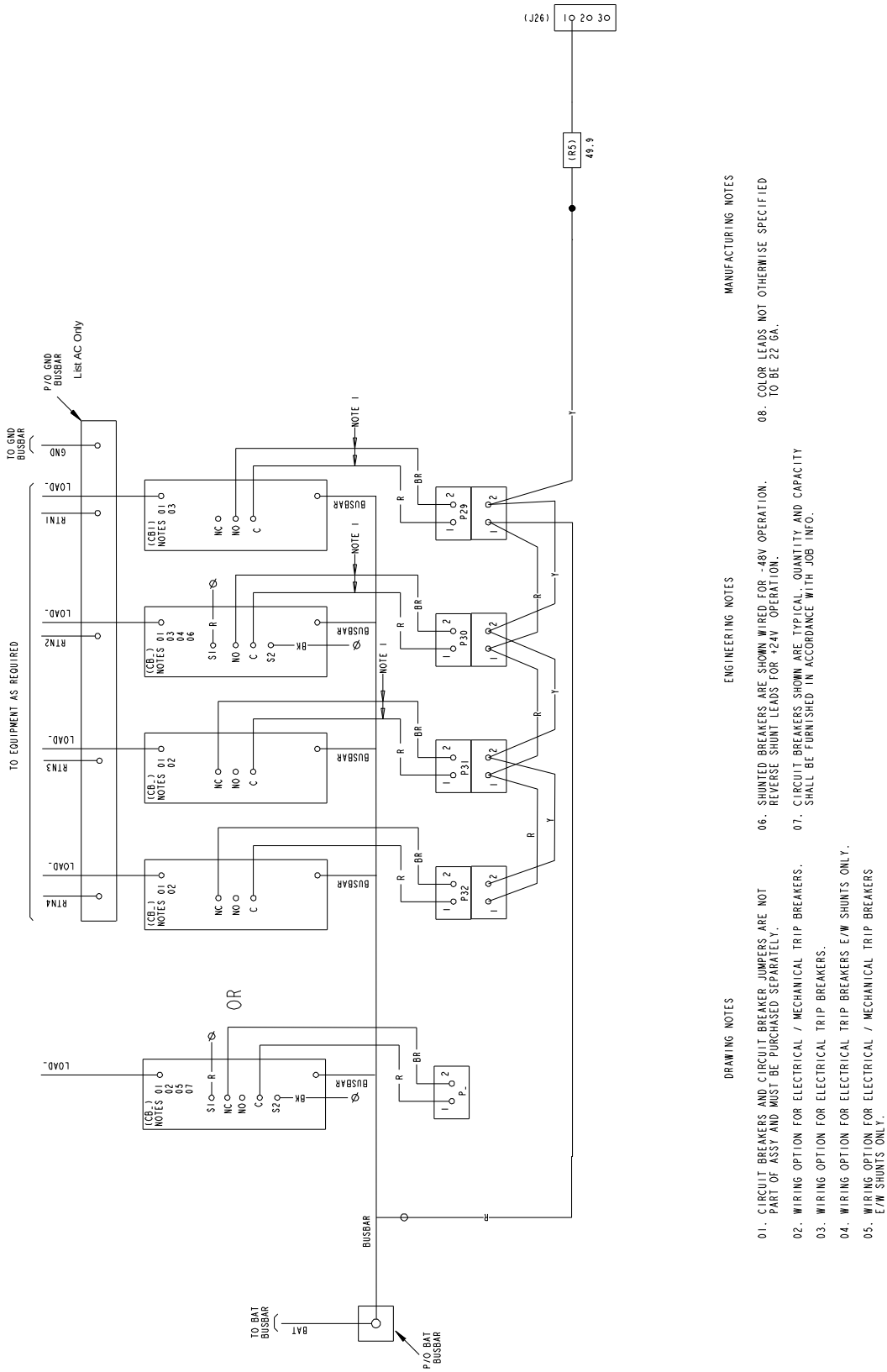
(J26) 10 20 30
(R5) 49.9
P/O GND BUSBAR
List AC Only
TO GND BUSBAR
GND
LOAD-
RTN1
RTN2
RTN3
RTN4
TO EQUIPMENT AS REQUIRED
(CB1) NOTES 01 03
(CB_) NOTES 01 02
(CB_) NOTES 01 03 04 06
(CB_) NOTES 01 02 05 07
NC NO C
S1 S2
BUSBAR
NOTE 1
BR R Y Ø
P29 P30 P31 P32 P_
OR
BUSBAR
TO BAT BUSBAR
BAT
P/O BAT BUSBAR
DRAWING NOTES
01. CIRCUIT BREAKERS AND CIRCUIT BREAKER JUMPERS ARE NOT PART OF ASSY AND MUST BE PURCHASED SEPARATELY.
02. WIRING OPTION FOR ELECTRICAL / MECHANICAL TRIP BREAKERS.
03. WIRING OPTION FOR ELECTRICAL TRIP BREAKERS.
04. WIRING OPTION FOR ELECTRICAL TRIP BREAKERS E/W SHUNTS ONLY.
05. WIRING OPTION FOR ELECTRICAL / MECHANICAL TRIP BREAKERS E/W SHUNTS ONLY.
ENGINEERING NOTES
06. SHUNTED BREAKERS ARE SHOWN WIRED FOR -48V OPERATION. REVERSE SHUNT LEADS FOR +24V OPERATION.
07. CIRCUIT BREAKERS SHOWN ARE TYPICAL. QUANTITY AND CAPACITY SHALL BE FURNISHED IN ACCORDANCE WITH JOB INFO.
MANUFACTURING NOTES
08. COLOR LEADS NOT OTHERWISE SPECIFIED TO BE 22 GA.

Figure 2-15
GJ/218 Circuit Breaker Wiring Diagram (List AC and AD)

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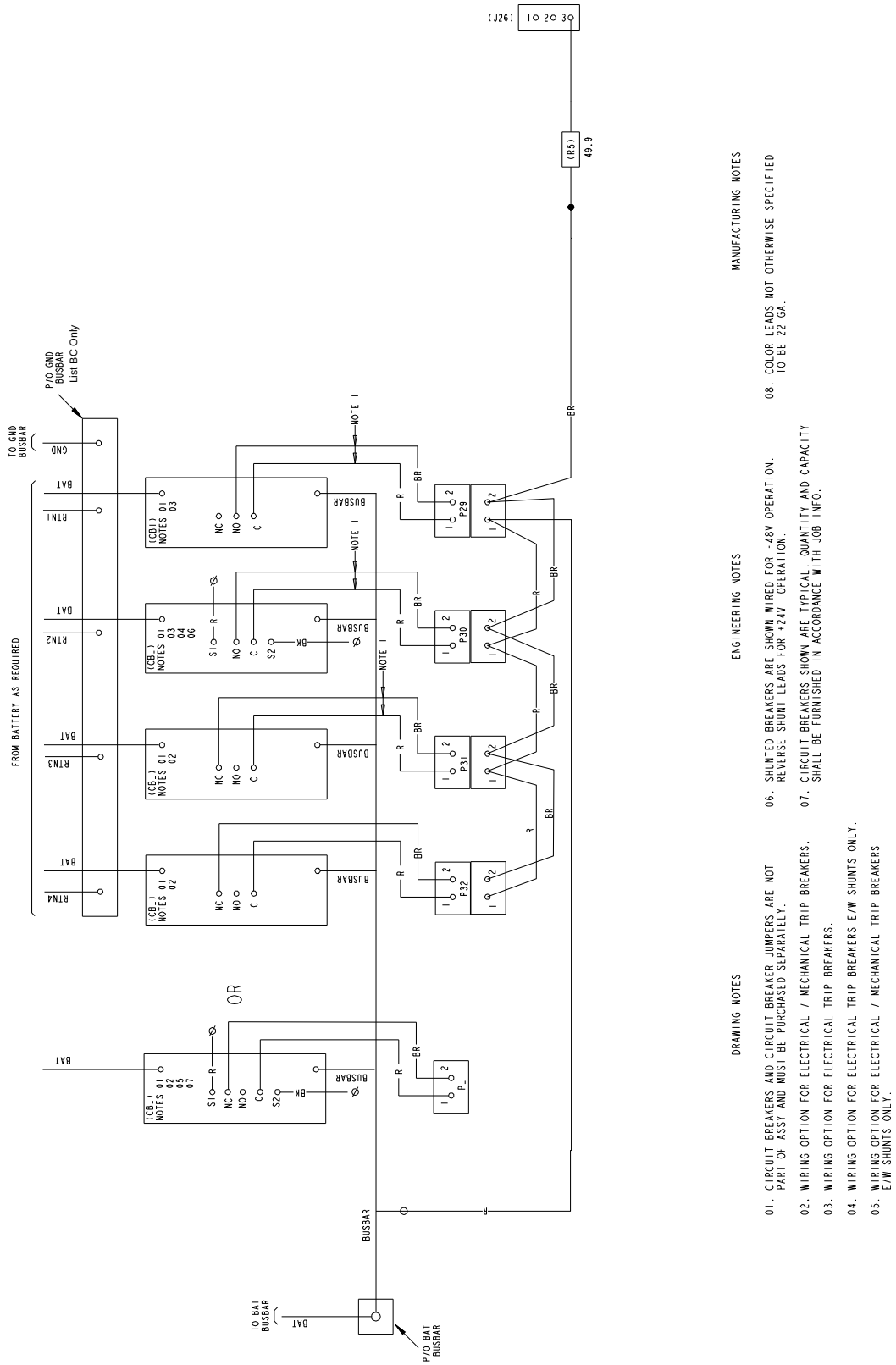
(J26) 1 O 2 O 3 O
(R5) 49.9
BR
NOTE 1
P/O GND BUSBAR List BC Only
TO GND BUSBAR
GND
BAT
RTN1
RTN2
RTN3
RTN4
FROM BATTERY AS REQUIRED
(CB1) NOTES 01 03
(CB_) NOTES 01 02
(CB_) NOTES 01 03 04 06
(CB_) NOTES 01 02 05 07
NC
NO
C
S1
S2
BK
R
BUSBAR
P29
P30
P31
P32
P_
OR
TO BAT BUSBAR
P/O BAT BUSBAR
MANUFACTURING NOTES
08. COLOR LEADS NOT OTHERWISE SPECIFIED TO BE 22 GA.
ENGINEERING NOTES
06. SHUNTED BREAKERS ARE SHOWN WIRED FOR -48V OPERATION. REVERSE SHUNT LEADS FOR +24V OPERATION.
07. CIRCUIT BREAKERS SHOWN ARE TYPICAL. QUANTITY AND CAPACITY SHALL BE FURNISHED IN ACCORDANCE WITH JOB INFO.
DRAWING NOTES
01. CIRCUIT BREAKERS AND CIRCUIT BREAKER JUMPERS ARE NOT PART OF ASSY AND MUST BE PURCHASED SEPARATELY.
02. WIRING OPTION FOR ELECTRICAL / MECHANICAL TRIP BREAKERS.
03. WIRING OPTION FOR ELECTRICAL TRIP BREAKERS.
04. WIRING OPTION FOR ELECTRICAL TRIP BREAKERS E/W SHUNTS ONLY.
05. WIRING OPTION FOR ELECTRICAL / MECHANICAL TRIP BREAKERS E/W SHUNTS ONLY.

Figure 2-16
GJ/218 Circuit Breaker Wiring Diagram (List BC and BD)

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CHAPTER 3.
SETTING JUMPERS AND SWITCH OPTIONS

CIRCUIT CARD LOCATIONS

Refer to Figure 3-1.

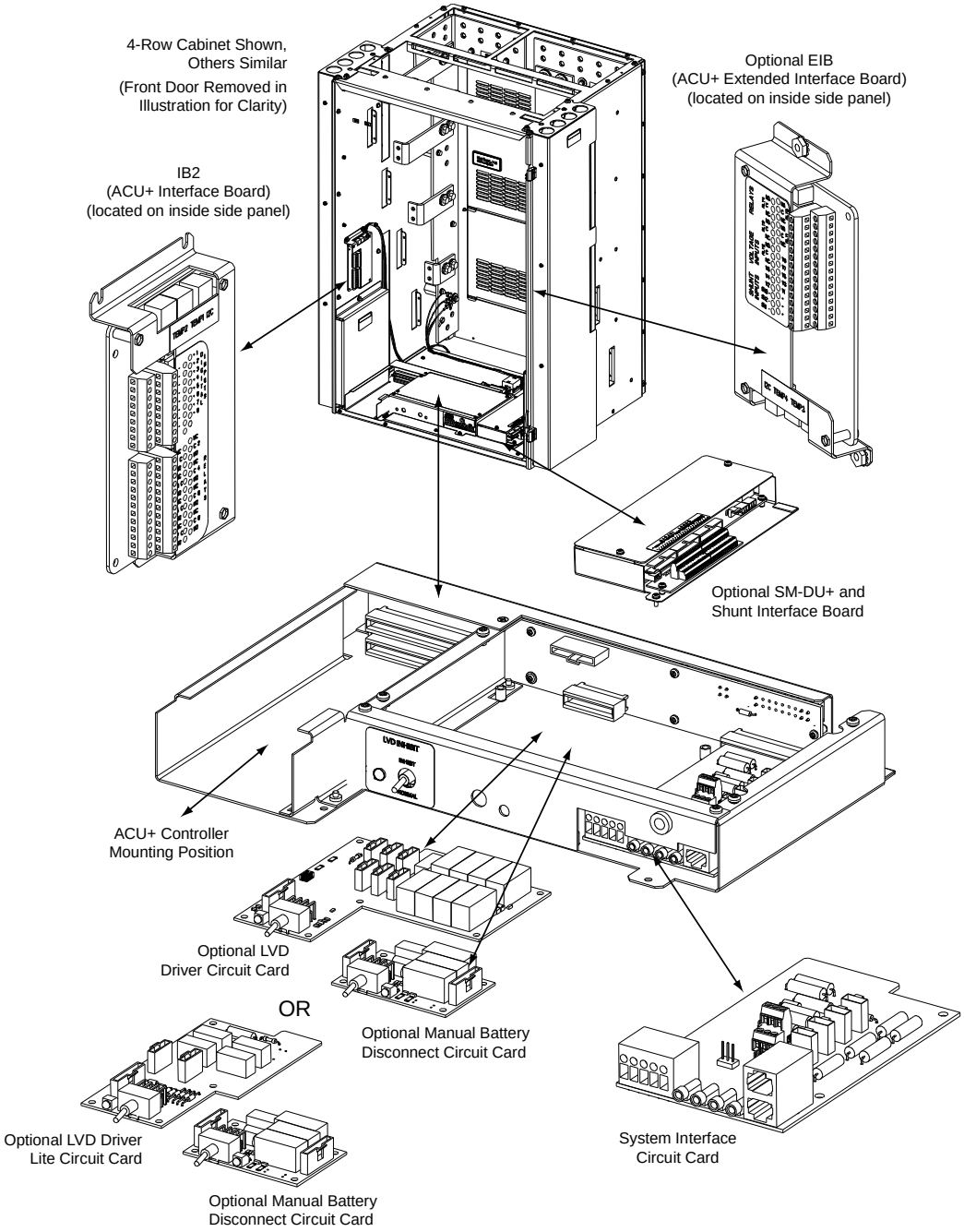

Figure 3-1
Circuit Card Locations

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JUMPERS ON SYSTEM INTERFACE CIRCUIT CARD

Perform the following procedures to verify the factory settings and/or make the required settings per your site requirements. These procedures can also be used to make adjustments on a replacement circuit card.

Controller Power Option

The controller is always powered from the internal "system" bus. A jumper option allows the controller to be also powered by battery. Battery power allows the controller to stay running in the event rectifiers are off or battery LVD opens (if installed). Note that if powering the controller from battery, the battery will drain if rectifiers are off or battery LVD opens (if installed). The controller's power consumption is 5W.

Procedure

1) Refer to Figure 3-2 and place the jumper on J8 in the "Battery Pwr" or "No Battery Pwr" position.

Internal/External Battery Monitoring

Selects to monitor (and display via the controller) battery voltage from either an "internal" or "external" source.

Procedure

1) Refer to Figure 3-2 and place the jumper on J10 in the "Internal" or "External" position. If "External" is selected, connect sense leads to TB1-4 and TB1-5 (see Figure 3-2).

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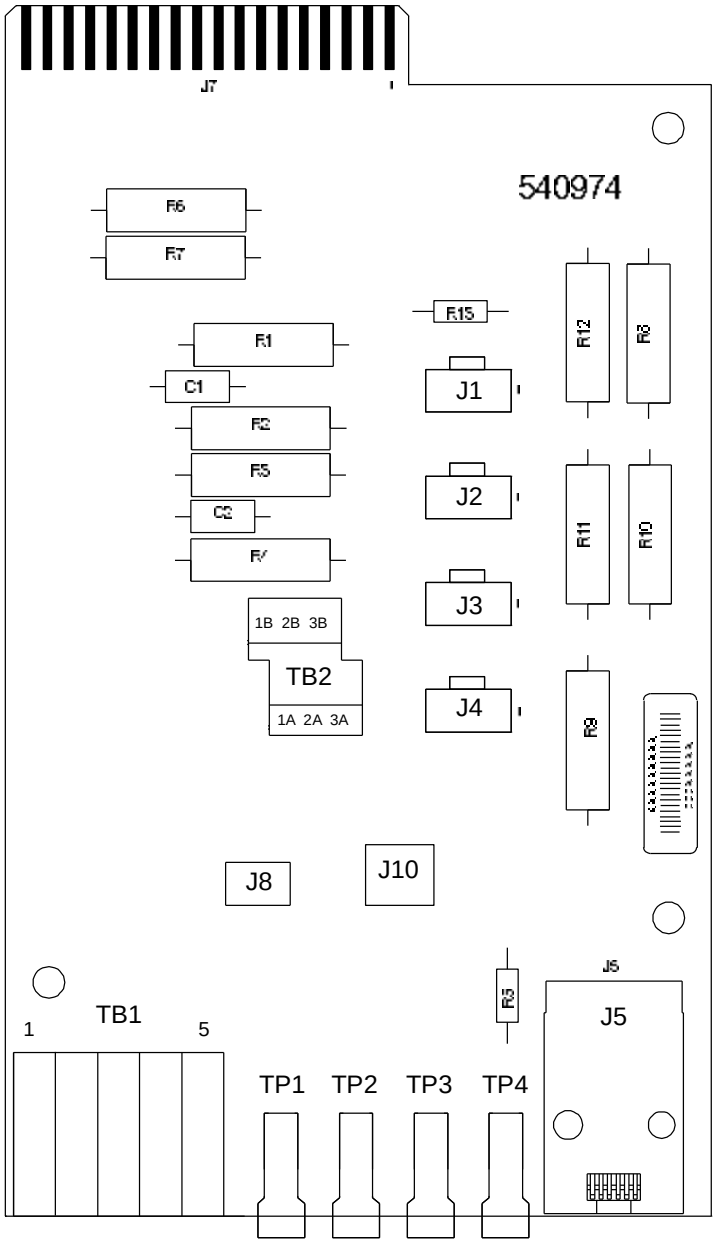
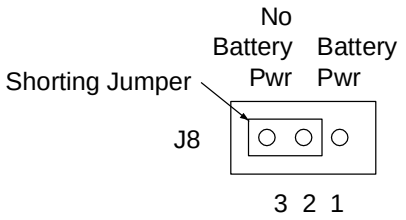
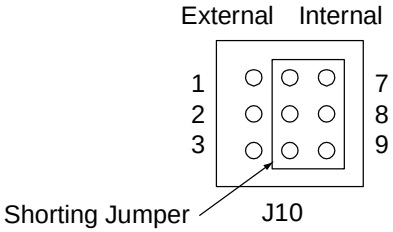


J8
Selects to power Controller from "Battery Power" or not.



J10
Battery Monitoring External / Internal (see TB1-4 and TB1-5 for external monitoring points)



TB1-4: External Battery Monitoring (-)
TB1-5: External Battery Monitoring (+)

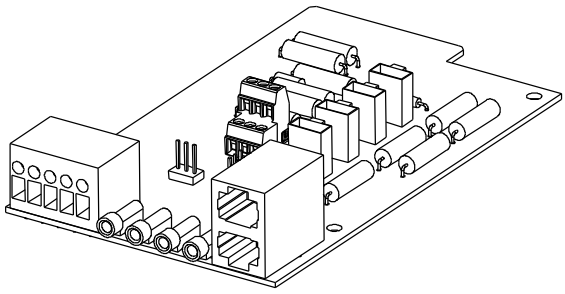


Figure 3-2
System Interface Circuit Card Jumper Locations

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SWITCH SETTINGS ON IB2 INTERFACE BOARD

Dip Switch SW1 on the IB2 board is used to set the communications address for this board. Refer to Table 3-1 for SW1 settings. Refer to Figure 3-3 for SW1 location.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

1) Ensure SW1 is set per Table 3-1. Refer to Figure 3-3 for location.

Setting	DIP Switch SW1	
	1	2
IB2	OFF	OFF

Table 3-1
IB2 Interface Board Switch Settings

SWITCH SETTING ON OPTIONAL EIB INTERFACE BOARD

Dip Switch SW1 on the EIB board is used to set the communications address for this board. Refer to Table 3-2 for SW1 settings. Refer to Figure 3-4 for SW1 location.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

1) Ensure SW1 is set per Table 3-2. Refer to Figure 3-4 for location.

Setting	DIP Switch SW1	
	1	2
EIB	ON	OFF

Table 3-2
Optional EIB Interface Board Switch Settings

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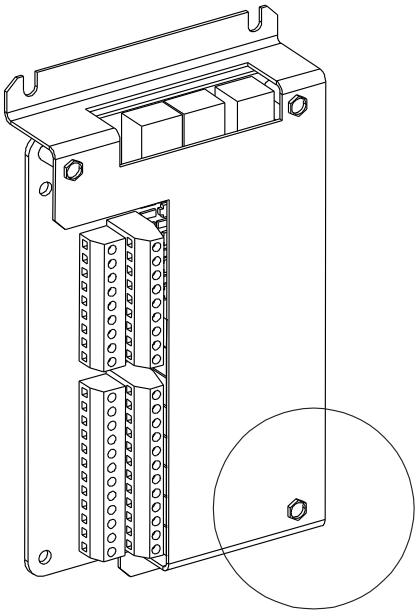
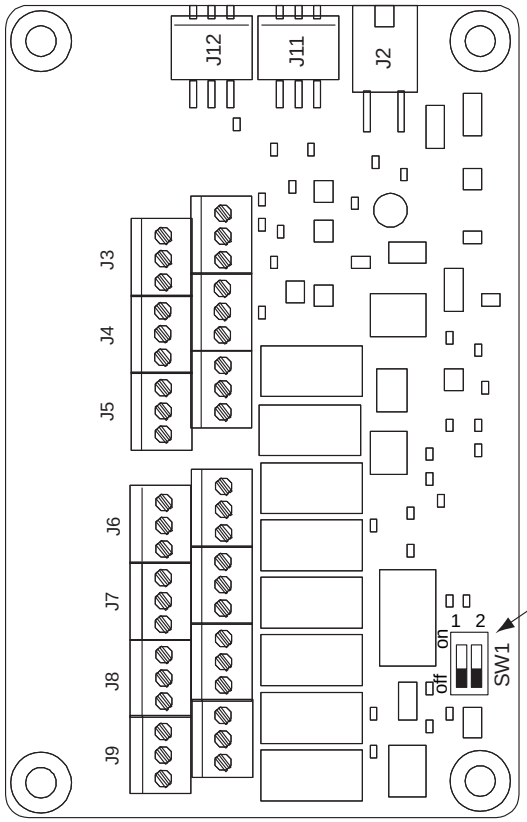


Switch SW1 is located in
this corner of the IB2 Board.

IB2 Interface Board
(Top View)



SW1
In this system, switch settings
must be in positions shown.

Setting	DIP Switch SW1	
	1	2
IB2	OFF	OFF

Figure 3-3
IB2 Interface Board Switch Location and Settings

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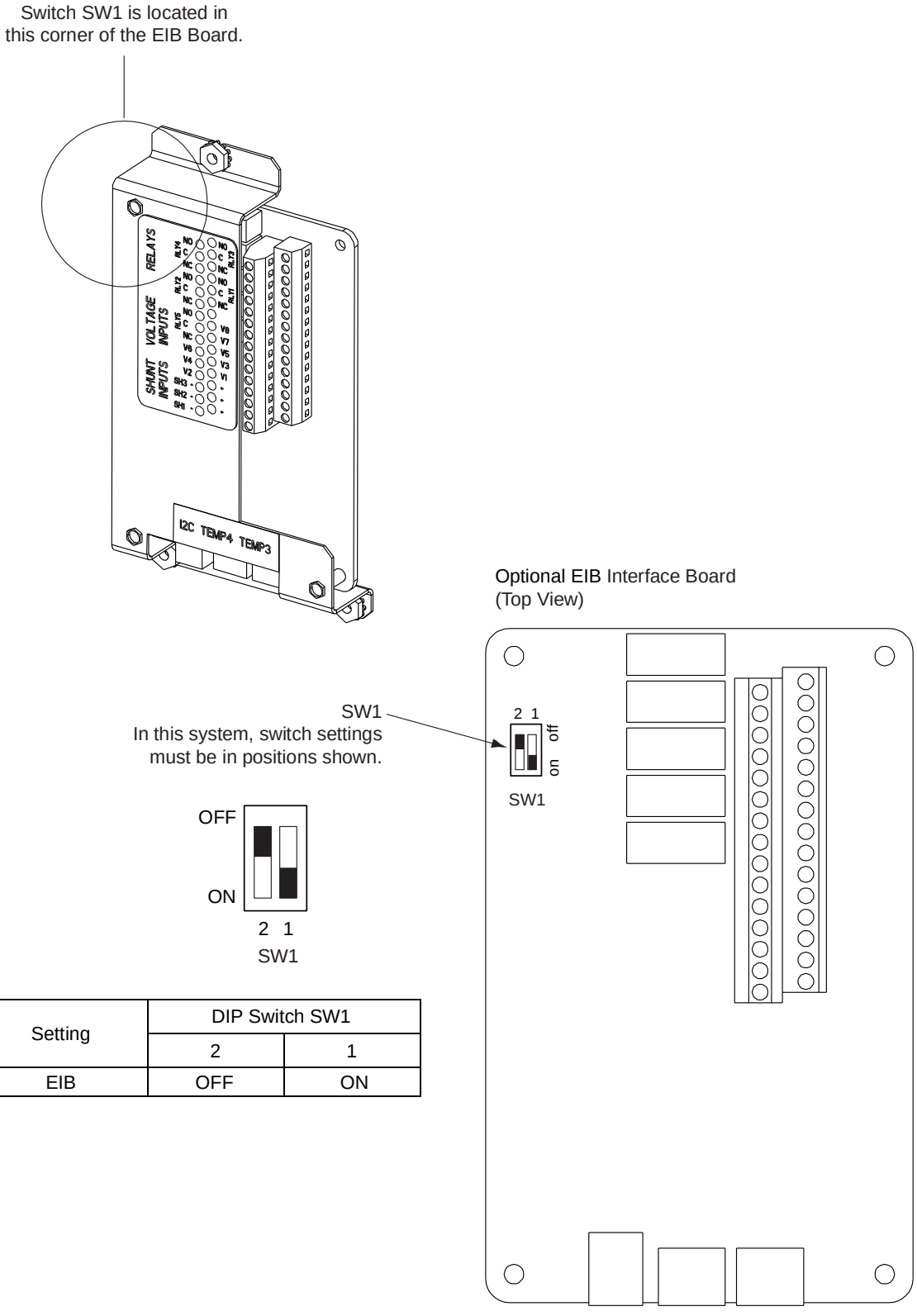

Setting	DIP Switch SW1	
	2	1
EIB	OFF	ON

Figure 3-4
Optional EIB Interface Board Switch Location and Settings

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SWITCH SETTING ON SM-DU+

SM-DU+ uses two (2) 8-bit switches for parameter setting (SW1 and SW2). Refer to Table 3-3 for SW1 and SW2 settings. Refer to Figure 3-5 for SW1 and SW2 locations.

Perform the following procedure to verify the factory settings. This procedure can also be used to make adjustments on a replacement circuit card.

Procedure

1) Ensure SW1 and SW2 are set per Table 3-3. Refer to Figure 3-5 for location.

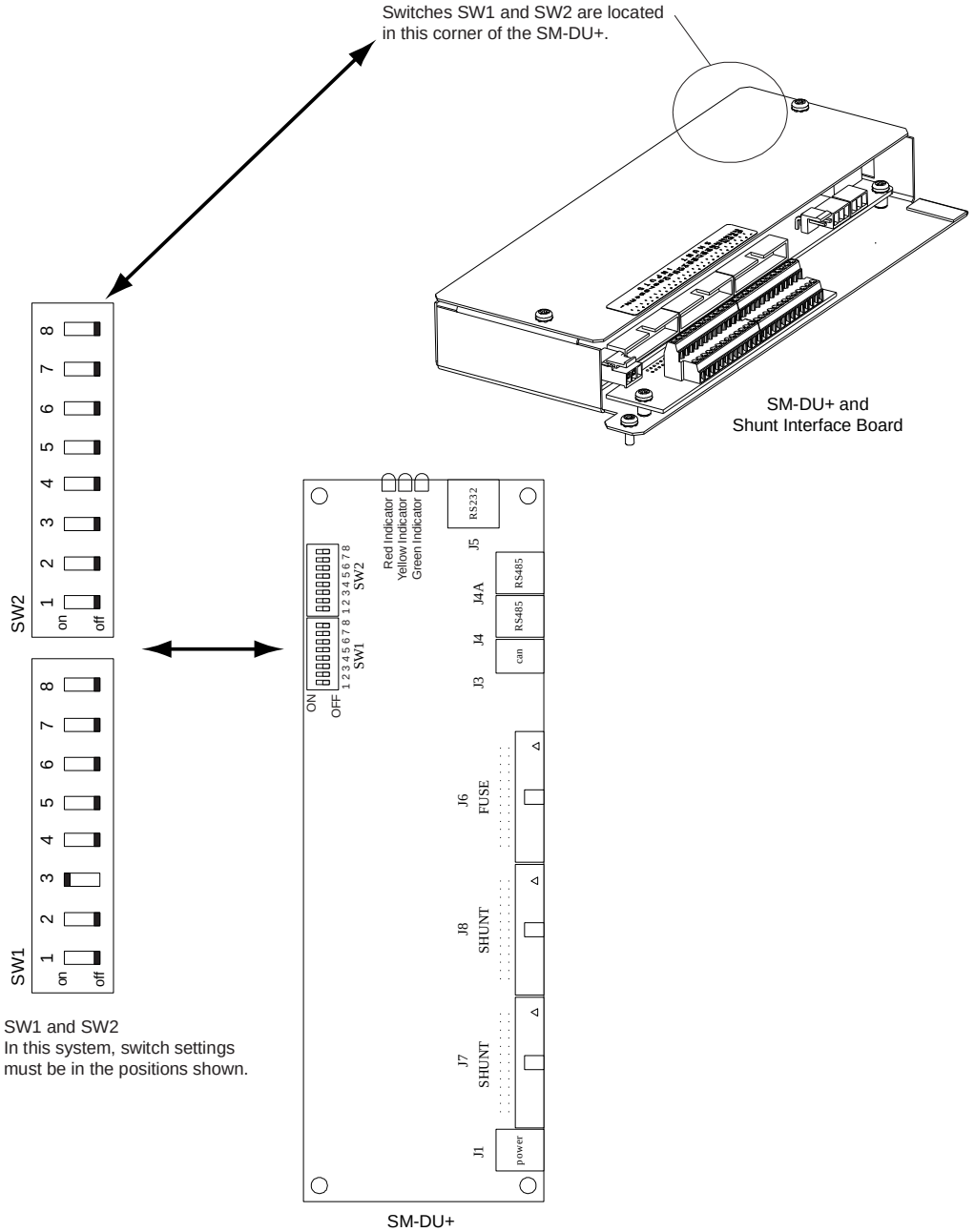

Figure 3-5
Optional SM-DU+ Switch Location and Settings

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DIP Switch SW1								
Reserved		**HW/ SW**	**Shunt Voltage**		**Shunt Current**			**Description of Status**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
NA		OFF	NA					Shunt parameter is set through DIP switch.
		ON						Shunt parameter is set through software **(note 1)**.
NA			OFF	OFF	NA			Shunt Voltage: 25mV **(note 1)**
			OFF	ON				Shunt Voltage: 50mV
			ON	OFF				Shunt Voltage: 60mV
			ON	ON				Shunt Voltage: 75mV
NA					OFF	OFF	OFF	Shunt Current: 500A **(note 1)**
					OFF	OFF	ON	Shunt Current: 100A
					OFF	ON	OFF	Shunt Current: 200A
					OFF	ON	ON	Shunt Current: 300A
					ON	OFF	OFF	Shunt Current: 400A
					ON	OFF	ON	Shunt Current: 1000A
					ON	ON	OFF	Shunt Current: 1500A
					ON	ON	ON	Shunt Current: 2000A
DIP Switch SW2								
Reserved				**Communications Address**			**Baud Rate**	**Description of Status**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
NA				OFF	OFF	OFF	NA	Address 1# **(Setting for SM-DU+ in this system)**
				OFF	OFF	ON		Address 2#
				OFF	ON	OFF		Address 3#
				OFF	ON	ON		Address 4#
				ON	OFF	OFF		Address 5#
				ON	OFF	ON		Address 6#
				ON	ON	OFF		Address 7#
				ON	ON	ON		Address 8#
NA							OFF	19200 **(note 1)**
							ON	9600

Note 1: Setting for this system.

Table 3-3
Optional SM-DU+ Board DIP Switch Settings

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CHAPTER 4.
MAKING ELECTRICAL CONNECTIONS

IMPORTANT SAFETY INSTRUCTIONS

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

WIRING CONSIDERATIONS

All wiring and branch circuit protection should follow the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), and applicable local codes. For operation in countries where the NEC is not recognized, follow applicable codes.

For wire size, branch circuit protection, crimp lug, and general wiring recommendations; refer to System Application Guide SAG581127000 and Power Data Sheet PD588705200 (PD588705201, PD58870520102, PD58870520103, PD58870520104).

Refer to drawing 031110100 for lug crimping information. Refer to drawings 031110200 and 031110300 for additional lug information.

Refer to Table 4-1 for supplemental lug crimping information when using the special application crimp lug / strap combination.

Crimp Lug Part No.		Crimp Tool Required[1], T&B Model TBM12 or TBM15 Hydraulic Heads		
		Color Key	Die Index/ Code No.	Die Cat. Number
245393500	Burndy: YA25L-4TCG1	PINK	42H	15508
245393600	Burndy: YA26L-4TCG1	BLACK	45	15526
245393700	Burndy: YA27L-4TCG1	ORANGE	50	15530
245393800	Burndy: YA28L-4TCG1	PURPLE	54H	15511
514872	T & B: 256-30695-1879	YELLOW	62	15510
	Burndy: YA29L-4TCG1			
514873	T & B: 256-30695-1880	RED	71	15514
	Burndy: YA31L-4TCG1			

[1] The lugs should be crimped to the specifications given in the manufacturer's instructions furnished with the crimp tool or lug.

Table 4-1
Supplemental Lug Crimping Information when using the
Special Application Crimp Lug / Strap Combination

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RELAY RACK GROUNDING CONNECTION (FRAME GROUND)

For relay rack grounding requirements, refer to the current edition of the American National Standards Institute (ANSI) approved National Fire Protection Association's (NFPA) National Electrical Code (NEC), applicable local codes, and your specific site requirements.

A customer's grounding network lead can be attached to the top of the relay rack. Provision is made for installing a lead with a two-hole lug that has 1/4" bolt clearance holes on 5/8" centers. When using 1/4-inch hardware, recommended torque is 84 in-lbs when a standard flat washer and lock washer are used. Refer to Figure 4-1 for locations.

Note: *REMOVE TAPE FROM HOLE LOCATIONS BEFORE INSTALLING LUG.*

Note: *The DC return connection to this system can remain isolated from system frame and chassis (DC-I).*

Note: *This system is suitable for installation as part of the Common Bonding Network (CBN).*

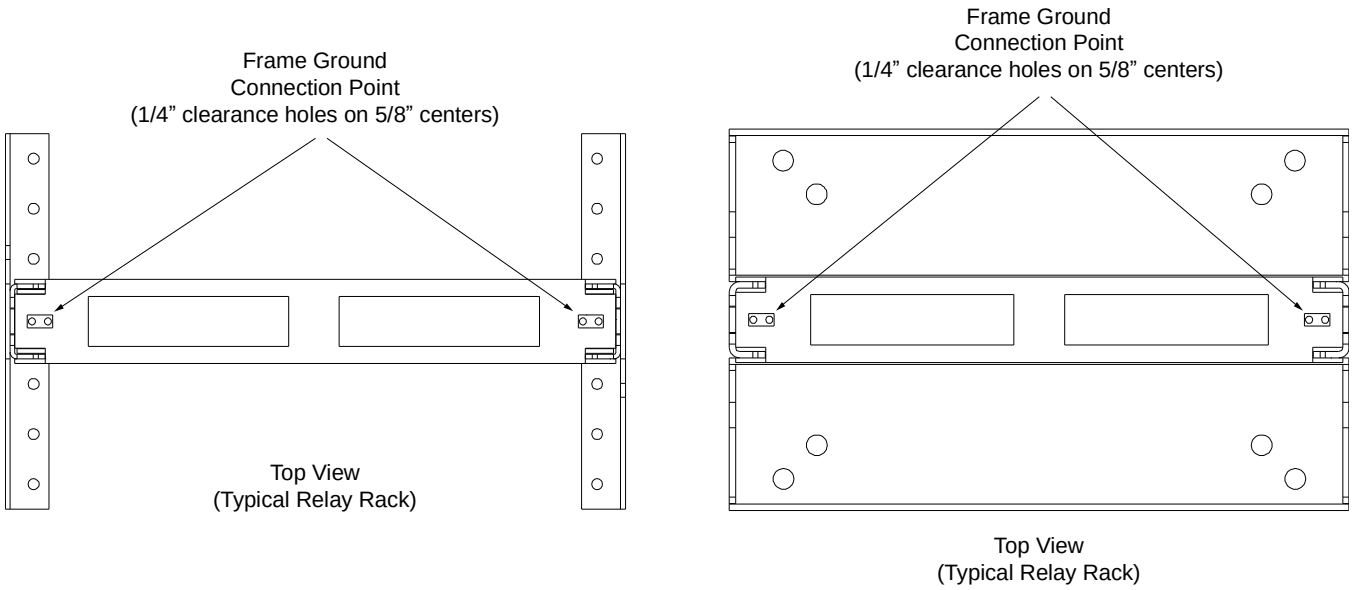

Figure 4-1
Relay Rack Frame Grounding Connection Points

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AC INPUT AND AC INPUT EQUIPMENT GROUNDING CONNECTIONS

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

Connections to Factory Installed Module Mounting Shelves

The system provides either a separate AC input connection for each rectifier position or a separate AC input connection for every two (2) rectifier positions in the factory installed module mounting shelves. Circular openings are provided in the top of the AC input wireway panels for AC input and AC input grounding conductors. The openings accept 3/4 inch conduit fittings. It is recommended that AC input wiring be provided to all rectifier mounting positions, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.

Note: *A grounding conductor must be provided with each conduit.*

PROCEDURE

Refer to Figure 4-2 as these procedures are performed.

Accessing Connections and Routing Wire

1) Remove the two AC input connector covers and the AC input wireway covers by first loosening the fasteners that secure each of them.
2) Install conduit fittings as required in the top of the AC input wireways. Plug buttons are provided, and must be installed in the openings not being used.
3) Route wiring into the AC input wireways through the previously installed conduit fittings.

Making AC Input Connections

Note: *Module mounting positions are lettered left to right as viewed from the front of the shelf, A-D in the top row and E-H in the bottom row of each shelf sub-assembly.*

Note: *If module mounting positions B, C, F, and G are intended solely for DC-DC Converter installation (Converter Option must be installed), AC input connections to these positions are not required.*

1) Make AC input connections as shown in Figure 4-2. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Recommended torque is 10 in-lbs for the individual PCU feed terminal blocks and 18 in-lbs for the dual PCU feed terminal blocks.

   <u>208/240 VAC Service Type:</u>

   - Line to Line:
     Connect Line 1 to Terminal 1.
     Connect Line 2 to Terminal 2.
   - Line to Neutral:
     Connect Line to Terminal 1.
     Connect Neutral to Terminal 2.

Making AC Equipment Grounding Connections

Note: *Make equipment grounding connections to earth ground,* ***not*** *to the branch circuit neutral conductor.*

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1) Connect AC input equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Recommended torque is 23 in-lbs.

Reinstalling Covers

1) After all AC input and equipment grounding connections have been made and checked, reinstall the two AC input connector covers and the AC input wireway covers. Secure each by tightening the fasteners.

AC INPUT CONNECTIONS,
INDIVIDUAL PCU FEED (581127000 LIST 40),
WHEN EQUIPPED WITH 588705201

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.

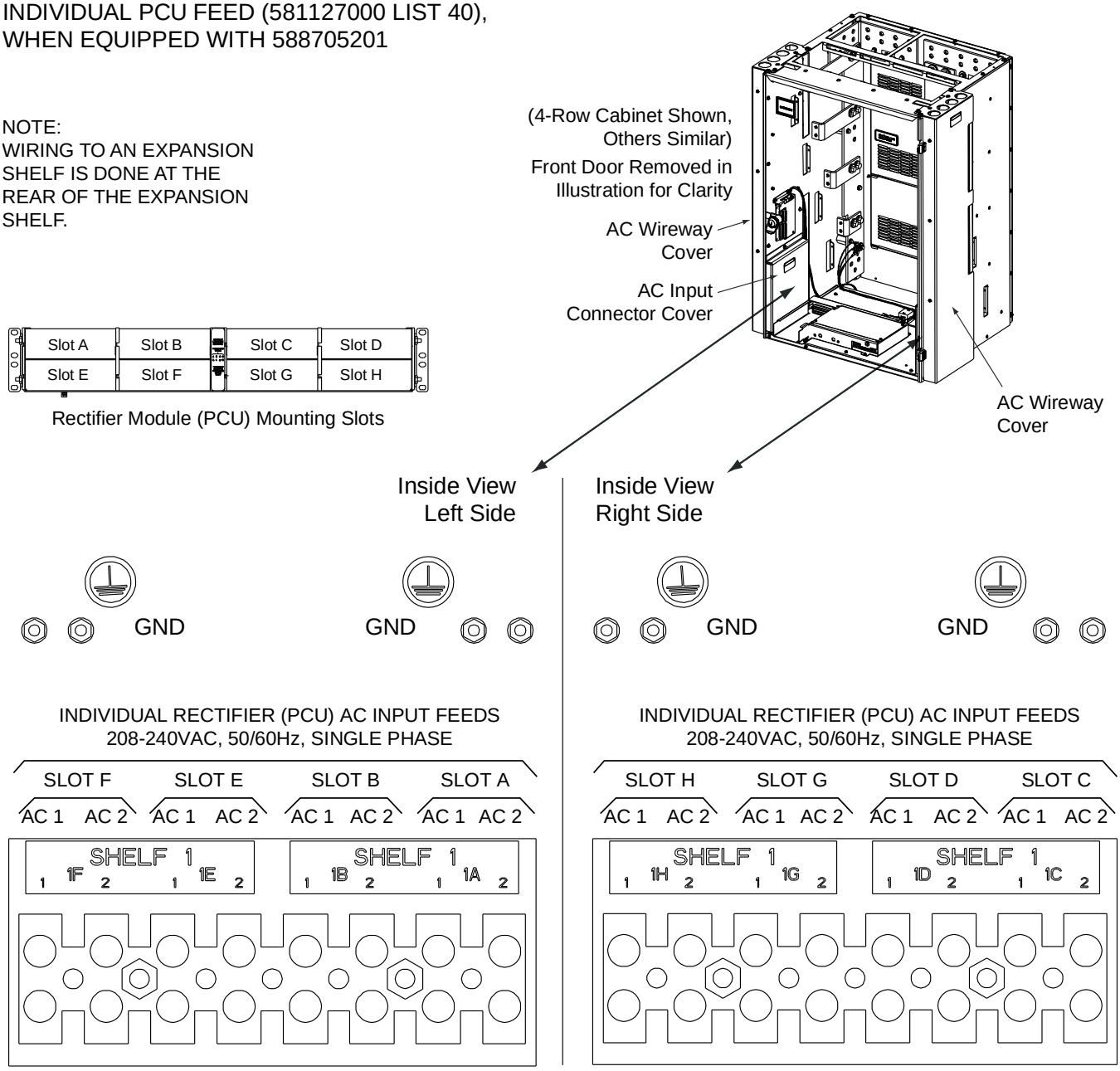

Figure 4-2 (cont'd on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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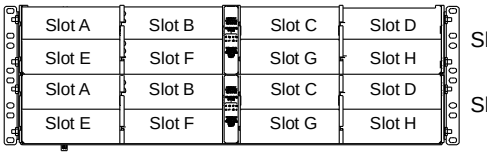
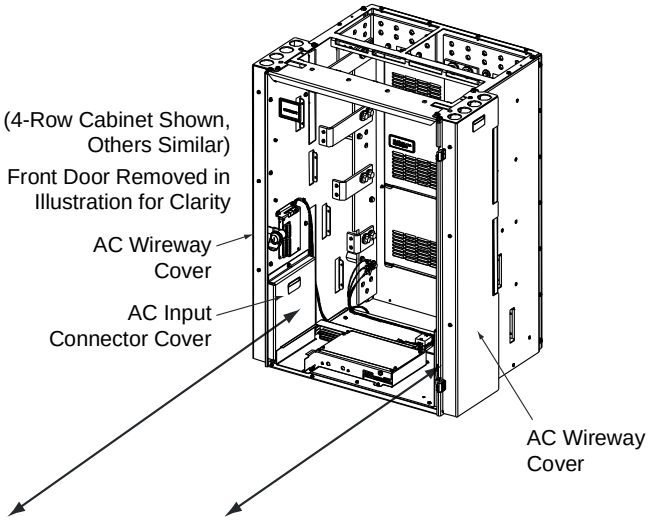
AC INPUT CONNECTIONS,
INDIVIDUAL PCU FEED (581127000 LIST 40),
WHEN EQUIPPED WITH 588705202

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.

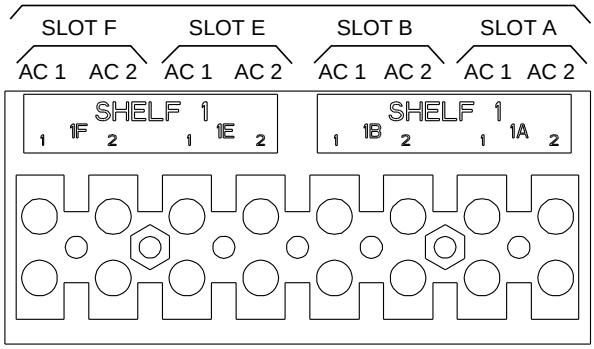


Rectifier Module (PCU) Mounting Slots

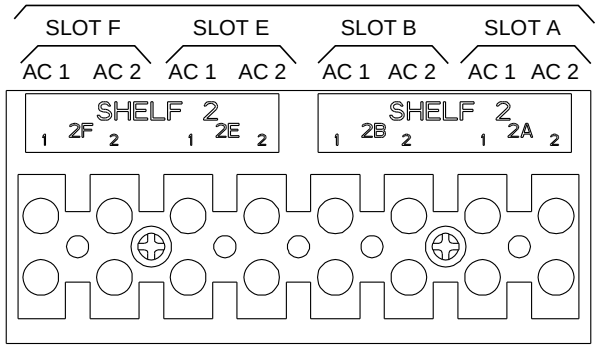

(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

Inside View Left Side

INDIVIDUAL RECTIFIER (PCU) AC INPUT FEEDS
208-240VAC, 50/60Hz, SINGLE PHASE

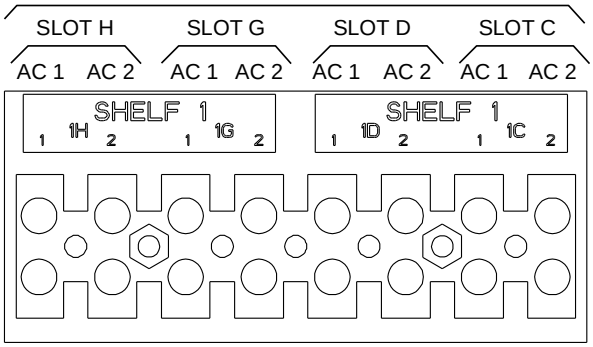


INDIVIDUAL RECTIFIER (PCU) AC INPUT FEEDS
208-240VAC, 50/60Hz, SINGLE PHASE



Inside View Right Side

INDIVIDUAL RECTIFIER (PCU) AC INPUT FEEDS
208-240VAC, 50/60Hz, SINGLE PHASE



INDIVIDUAL RECTIFIER (PCU) AC INPUT FEEDS
208-240VAC, 50/60Hz, SINGLE PHASE

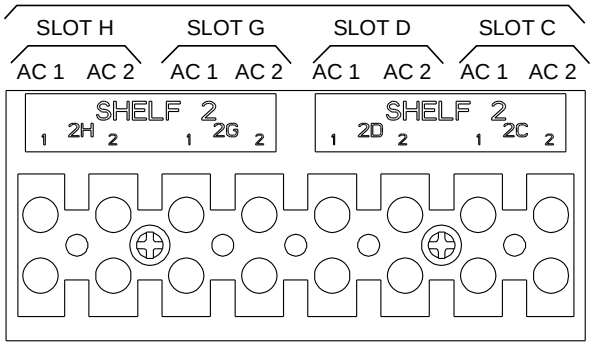


Figure 4-2 (cont'd from previous page, on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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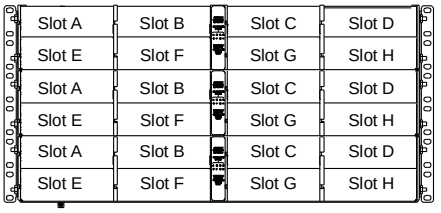
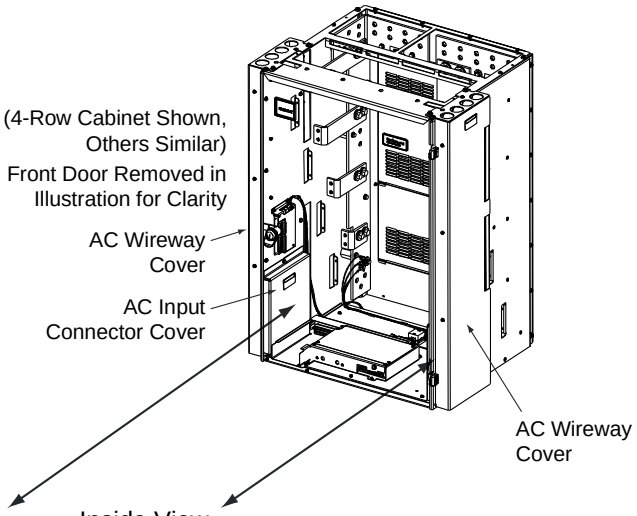
AC INPUT CONNECTIONS,
INDIVIDUAL PCU FEED (581127000 LIST 40),
WHEN EQUIPPED WITH 588705203

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.



Rectifier Module (PCU) Mounting Slots


(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

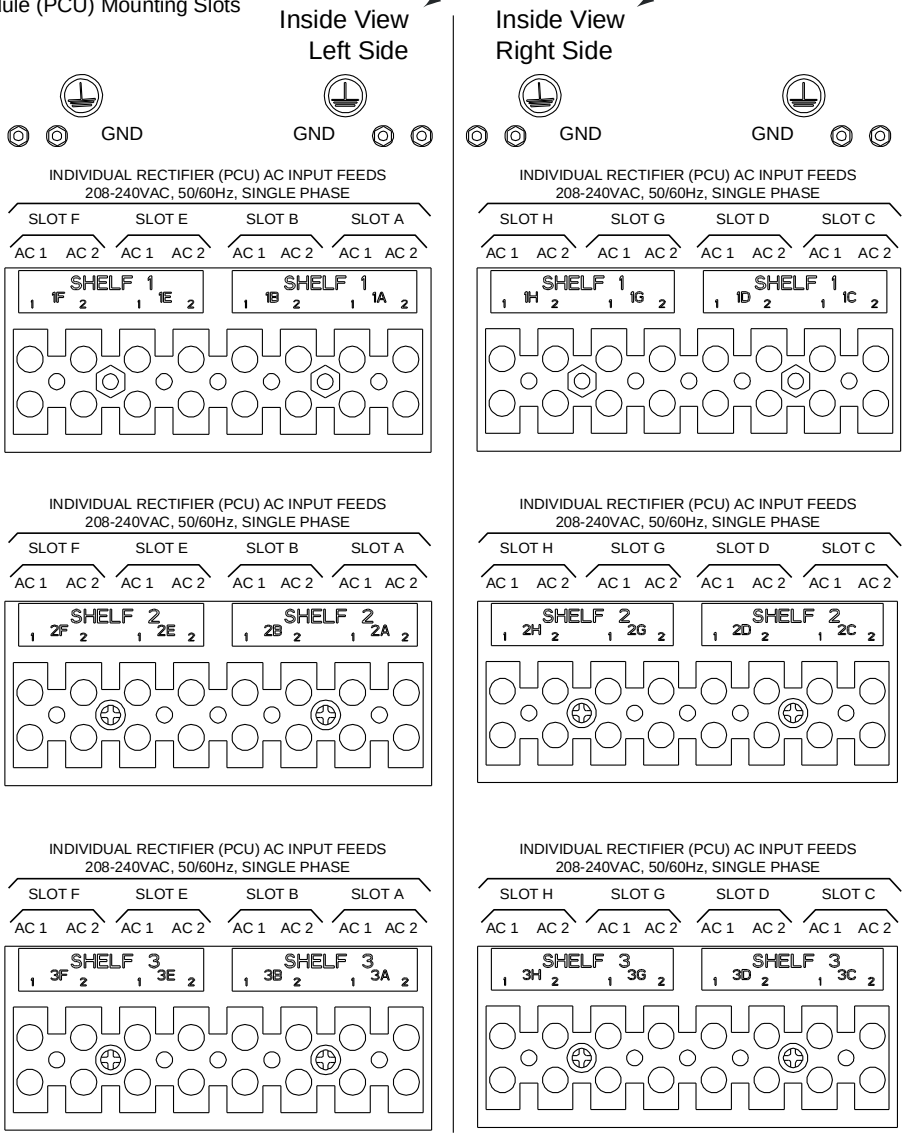


Figure 4-2 (cont'd from previous page, on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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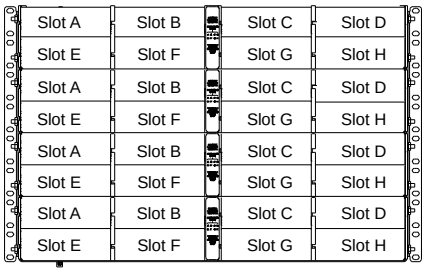
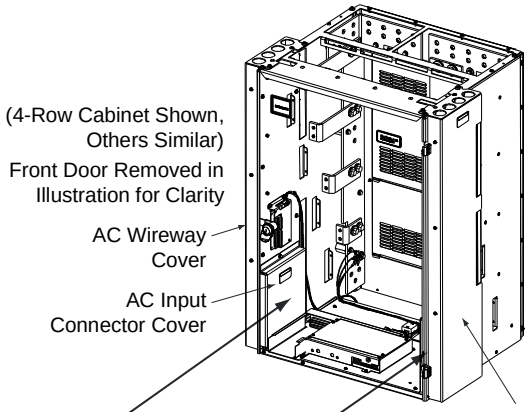
AC INPUT CONNECTIONS,
INDIVIDUAL PCU FEED (581127000 LIST 40),
WHEN EQUIPPED WITH 588705204

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.

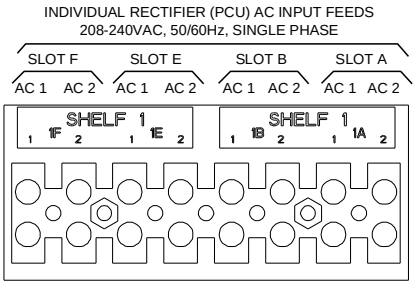


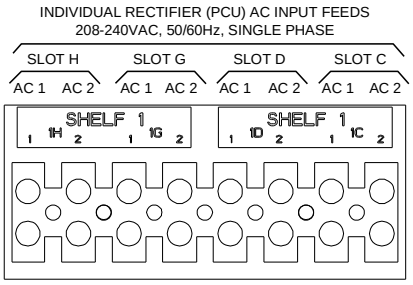
Rectifier Module (PCU) Mounting Slots

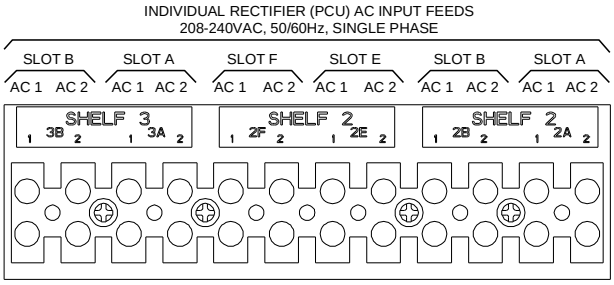

(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

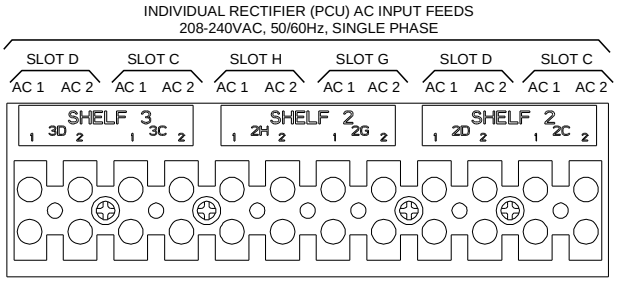
Inside View Left Side

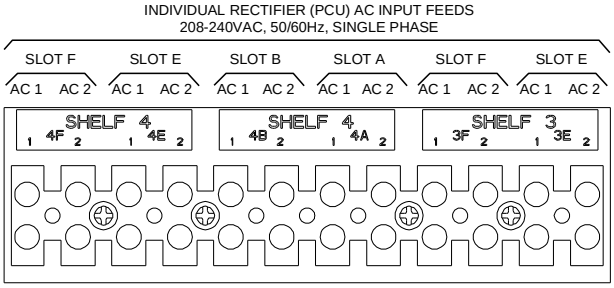
Inside View Right Side











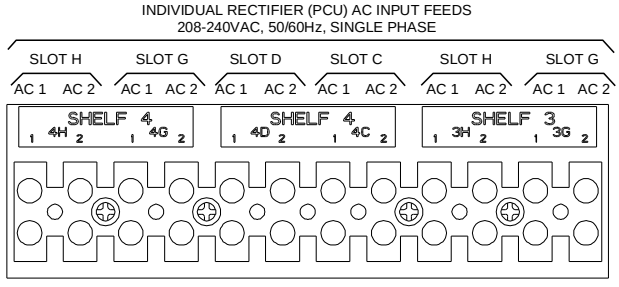


Figure 4-2 (cont'd from previous page, on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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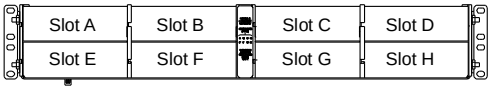
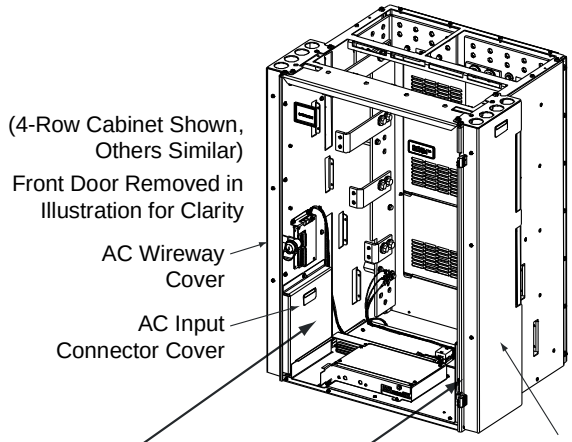
AC INPUT CONNECTIONS,
DUAL PCU FEED (581127000 LIST 41),
WHEN EQUIPPED WITH 588705201

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.



Rectifier Module (PCU) Mounting Slots


(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

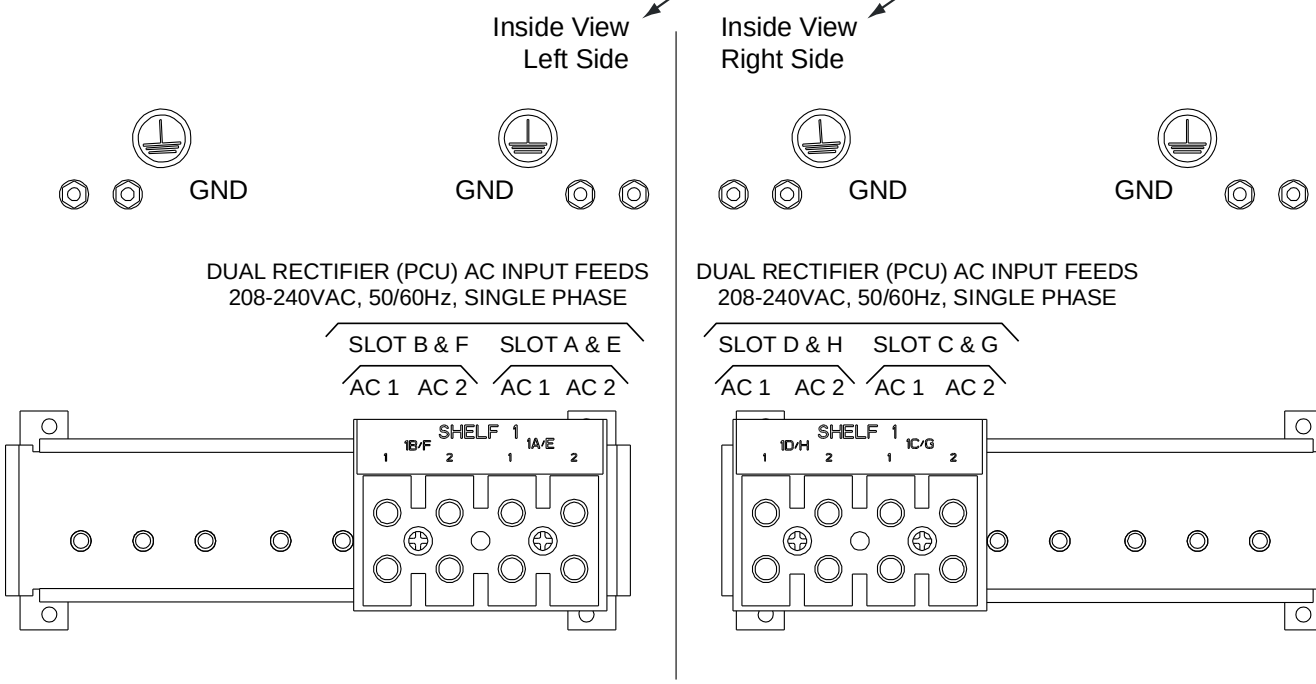


Figure 4-2 (cont'd from previous page, on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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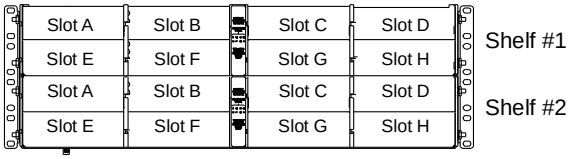
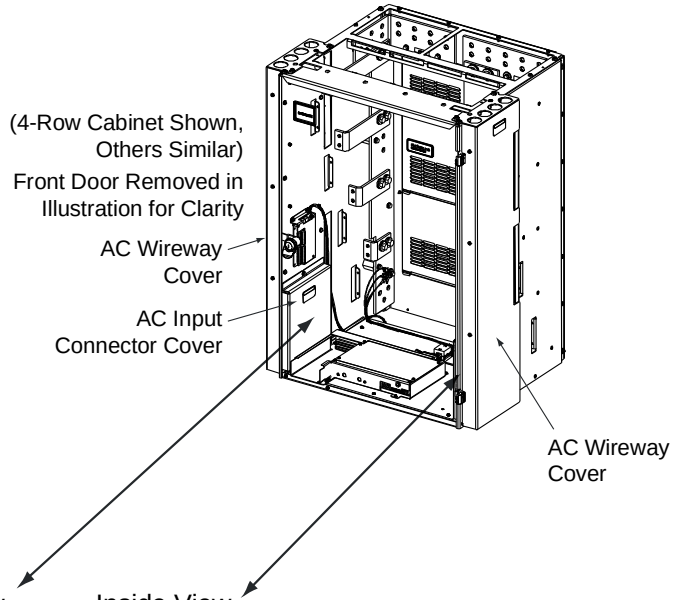
AC INPUT CONNECTIONS,
DUAL PCU FEED (581127000 LIST 41),
WHEN EQUIPPED WITH 588705202

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.



Rectifier Module (PCU) Mounting Slots


(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

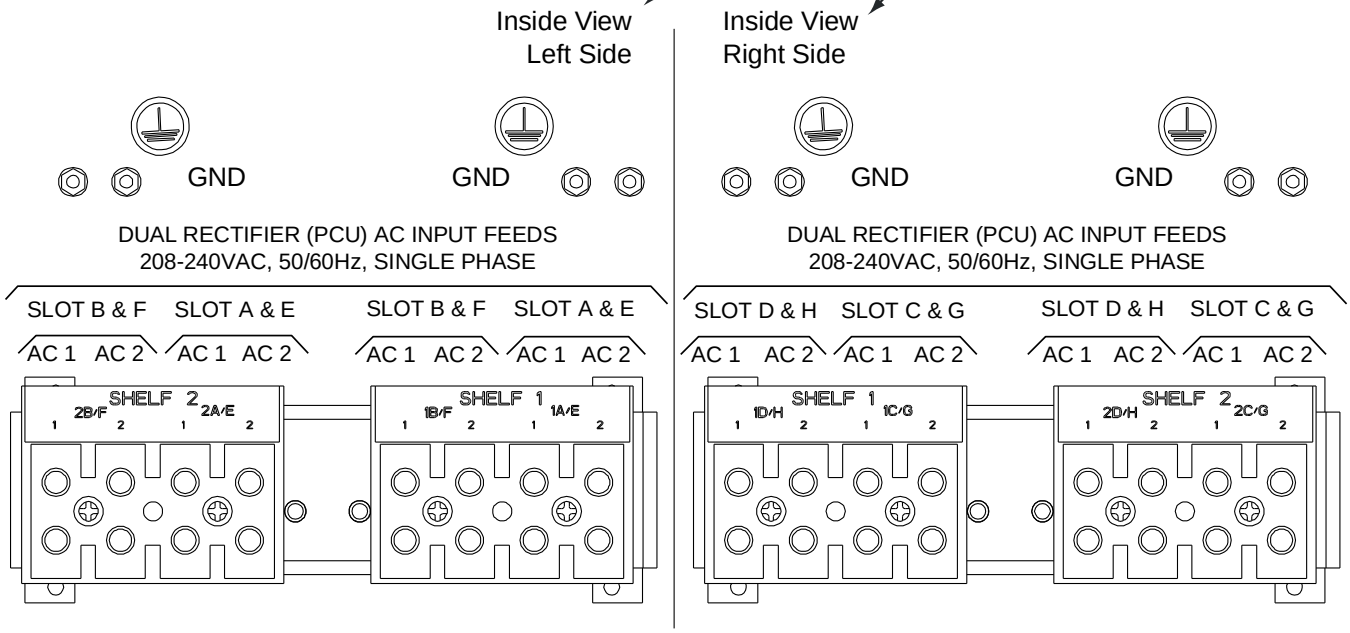


Figure 4-2 (cont'd from previous page, on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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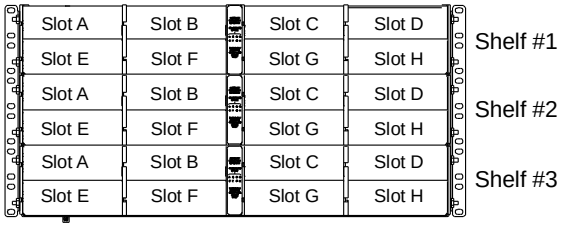
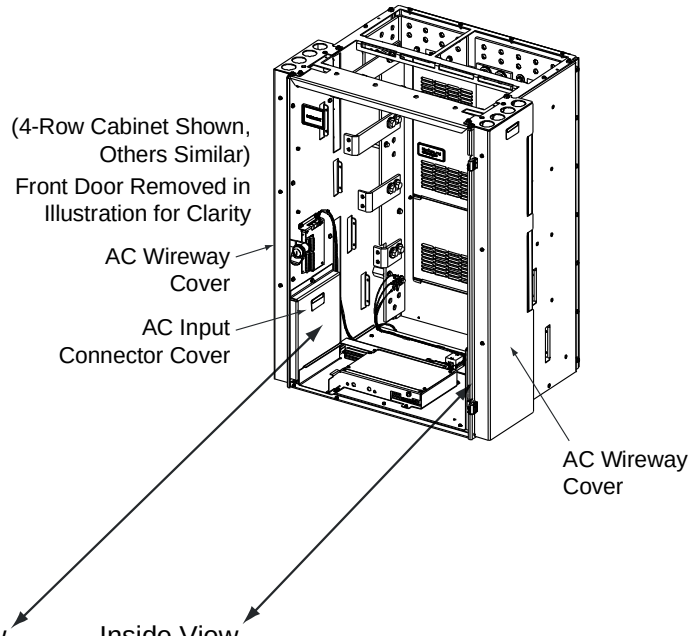
AC INPUT CONNECTIONS,
DUAL PCU FEED (581127000 LIST 41),
WHEN EQUIPPED WITH 588705203

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.



Rectifier Module (PCU) Mounting Slots


(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

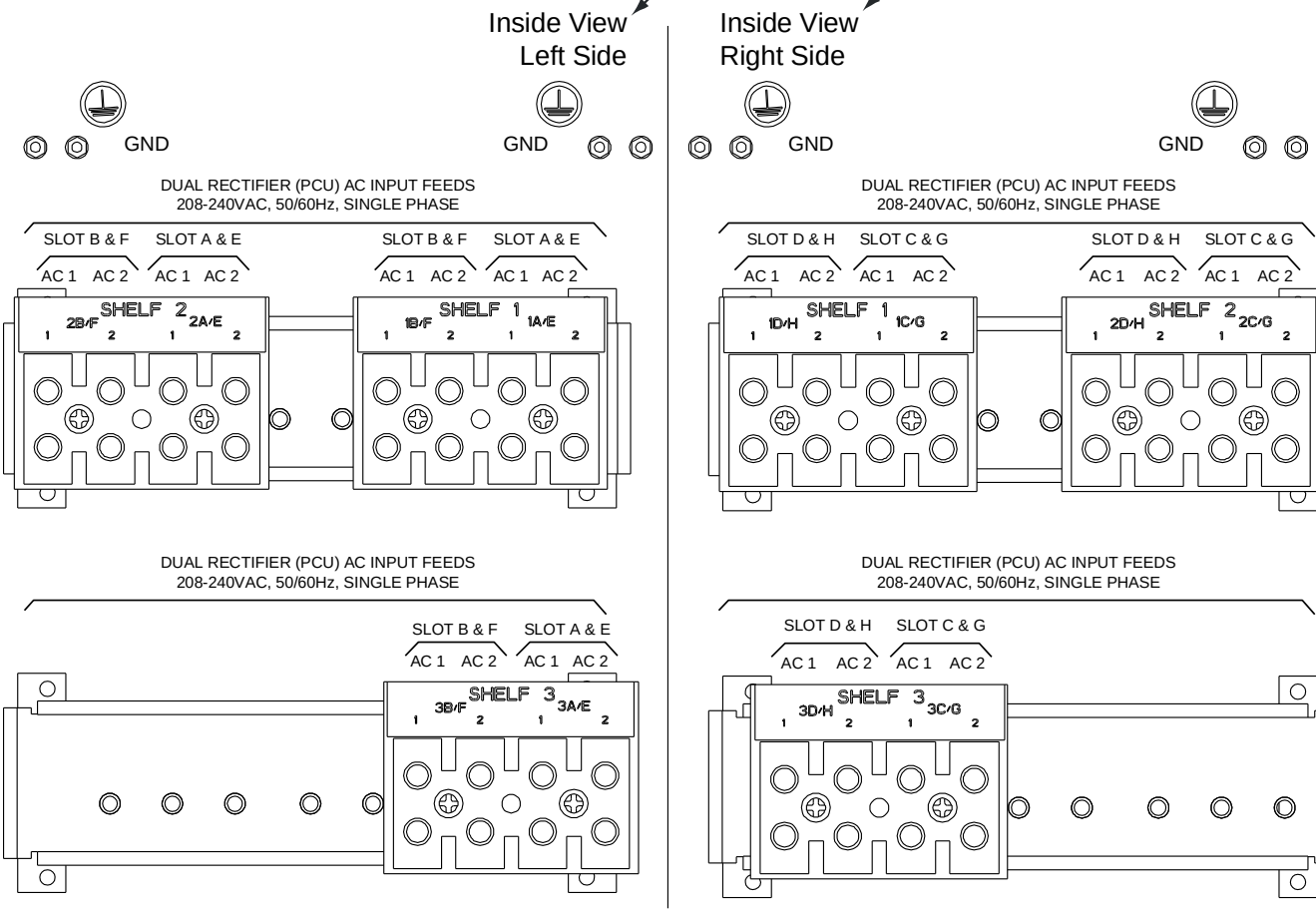


Figure 4-2 (cont'd from previous page, on next page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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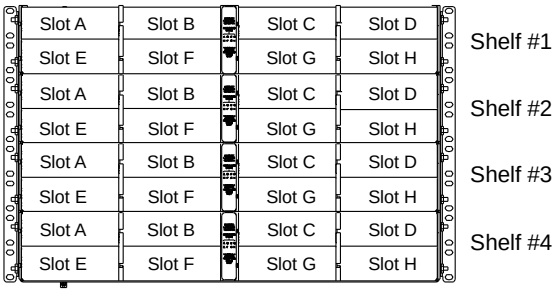
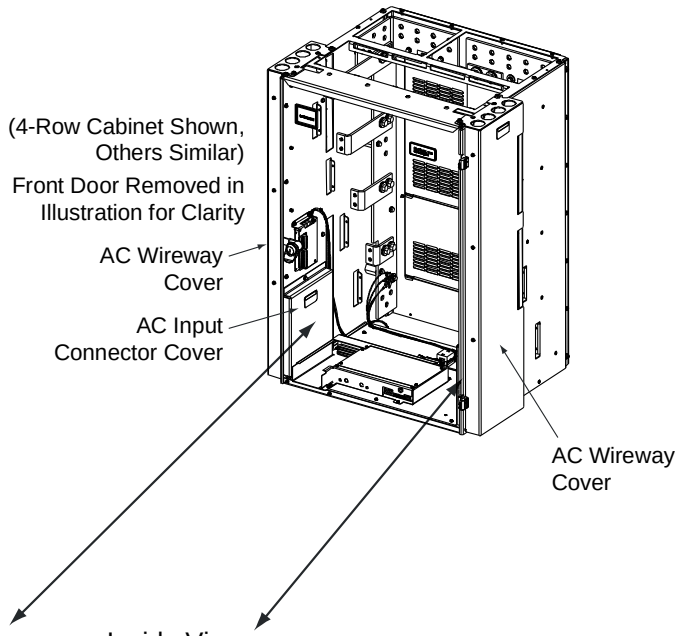
AC INPUT CONNECTIONS,
DUAL PCU FEED (581127000 LIST 41),
WHEN EQUIPPED WITH 588705204

NOTE:
WIRING TO AN EXPANSION SHELF IS DONE AT THE REAR OF THE EXPANSION SHELF.



Rectifier Module (PCU) Mounting Slots


(4-Row Cabinet Shown, Others Similar)
Front Door Removed in Illustration for Clarity
AC Wireway Cover
AC Input Connector Cover
AC Wireway Cover

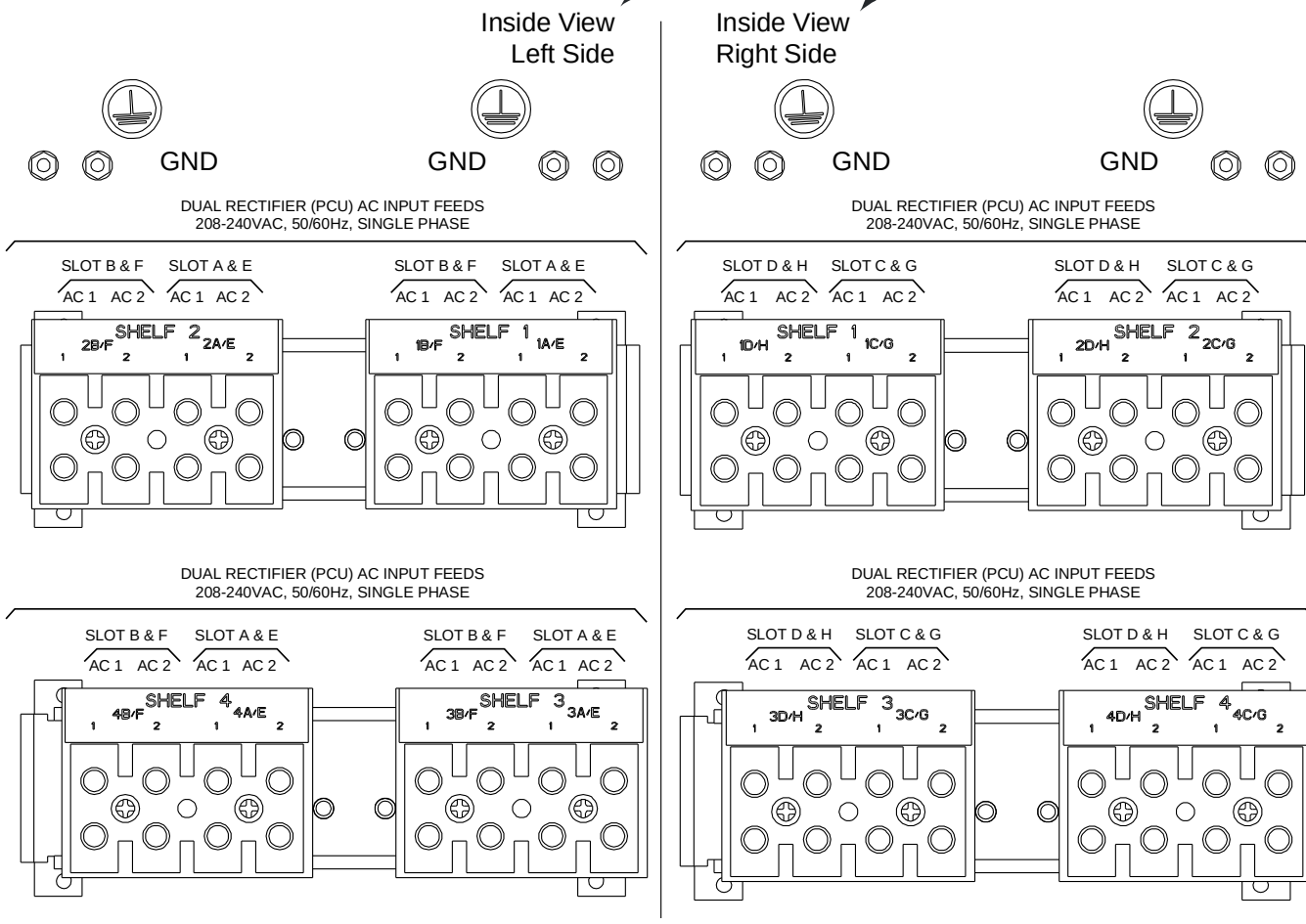


Figure 4-2 (cont'd from previous page)
AC Input and Equipment Grounding Connections to Factory Installed Module Mounting Shelves

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Connections to Field Expansion Module Mounting Assembly

The field expansion module mounting assembly provides separate AC input connections for each rectifier. Circular openings are provided in the side panels (side feed) and rear covers (rear feed) of the module mounting assembly for AC input and AC input equipment-grounding conductors. The openings accept 3/4" inch conduit fittings. AC input wiring should be provided to all mounting positions intended for rectifiers, including currently unused positions. This wiring will ease future installation of rectifiers to meet increased load requirements.

Note: *A grounding conductor must be provided with each conduit.*

PROCEDURE

Refer to Figure 4-3 as these procedures are performed.

Accessing Connections and Routing Wire

1) Remove the two AC input access covers from the rear of the module mounting assembly by first removing the screws that secure them.
2) Install conduit fittings in the side or rear openings as required. Plug buttons are provided, and must be installed in the openings not being used.
3) Route wiring into the shelf through the previously installed conduit fittings.

Making AC Input Connections

Note: *Module mounting positions are lettered left to right as viewed from the front of the shelf, A-D in the top row and E-H in the bottom row.*

Note: *If module mounting positions B, C, F, and G are intended solely for DC-DC Converter installation (Converter Option must be installed), AC input connections to these positions are not required.*

1) Make AC input connections as shown in Figure 4-3. Connect each wire by inserting the stripped end into the wire opening, and then tightening the screw. Recommended torque is 10 in-lbs.

   <u>208/240 VAC Service Type:</u>

   - Line to Line:
     Connect Line 1 to Terminal 1.
     Connect Line 2 to Terminal 2.
   - Line to Neutral:
     Connect Line to Terminal 1.
     Connect Neutral to Terminal 2.

Making AC Equipment Grounding Connections

Note: *Make equipment grounding connections to earth ground,* ***not*** *to the branch circuit neutral conductor.*

1) Connect AC input equipment grounding leads to the frame ground studs using installer-provided ring lugs and factory-supplied mounting hardware. Recommended torque is 23 in-lbs.

Reinstalling Covers

1) After all AC input and equipment grounding connections have been made and checked, reinstall the two AC input access covers on the back of the shelf. Secure with the previously removed screws.

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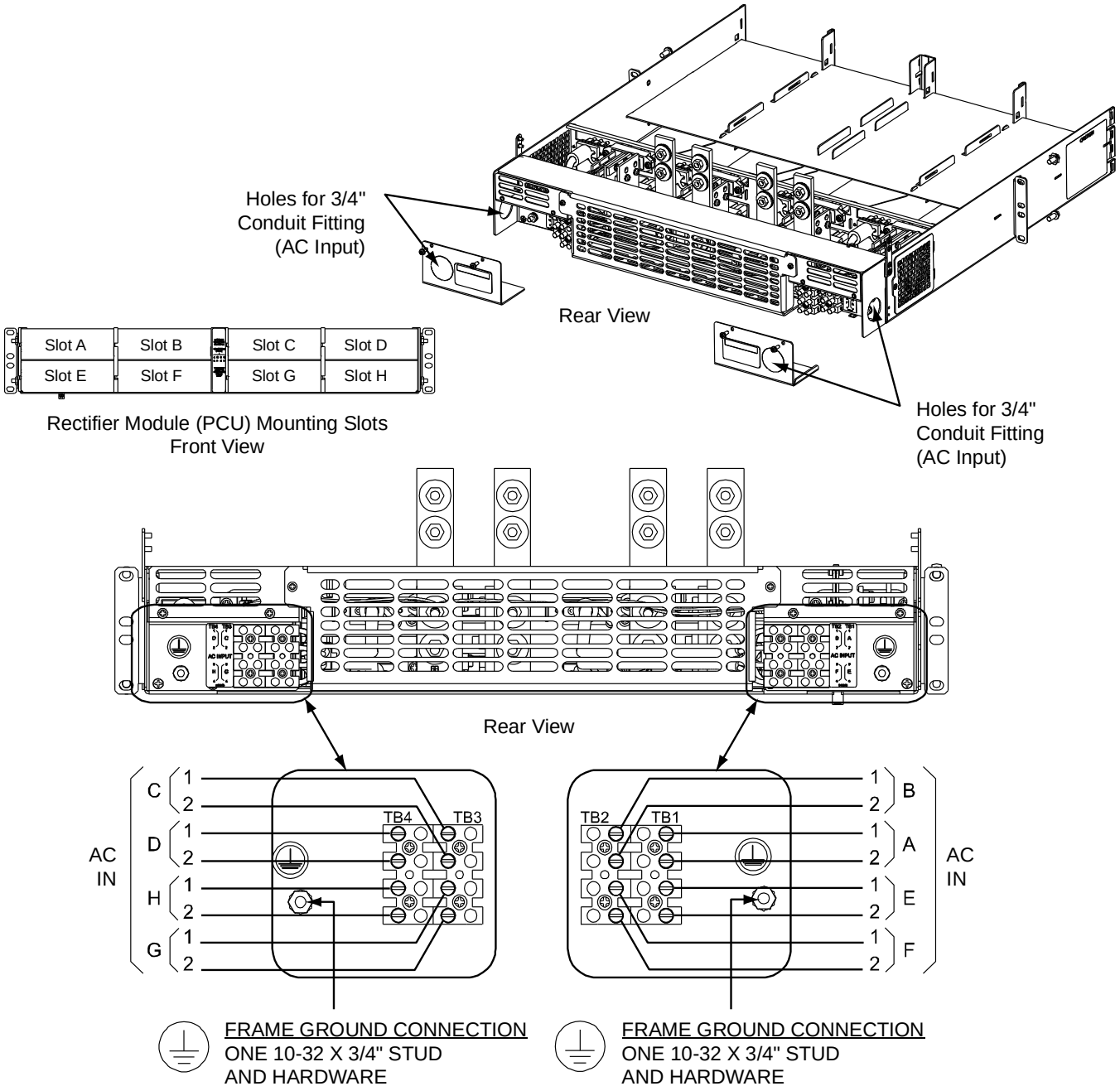

Note: Module mounting positions are lettered left to right as viewed from front of shelf, A-D in top row and E-H in bottom row.

Note: If mounting positions B, C, F, and G are intended solely for DC-DC Converter installation (Converter Option must be installed), AC input connections to these positions are not required.

Figure 4-3
AC Input and Equipment Grounding Connections to Field Expansion Module Mounting Assembly

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EXTERNAL ALARM, REFERENCE, MONITORING, AND CONTROL CONNECTIONS

Circuit Card Locations

Refer to Figure 4-4.

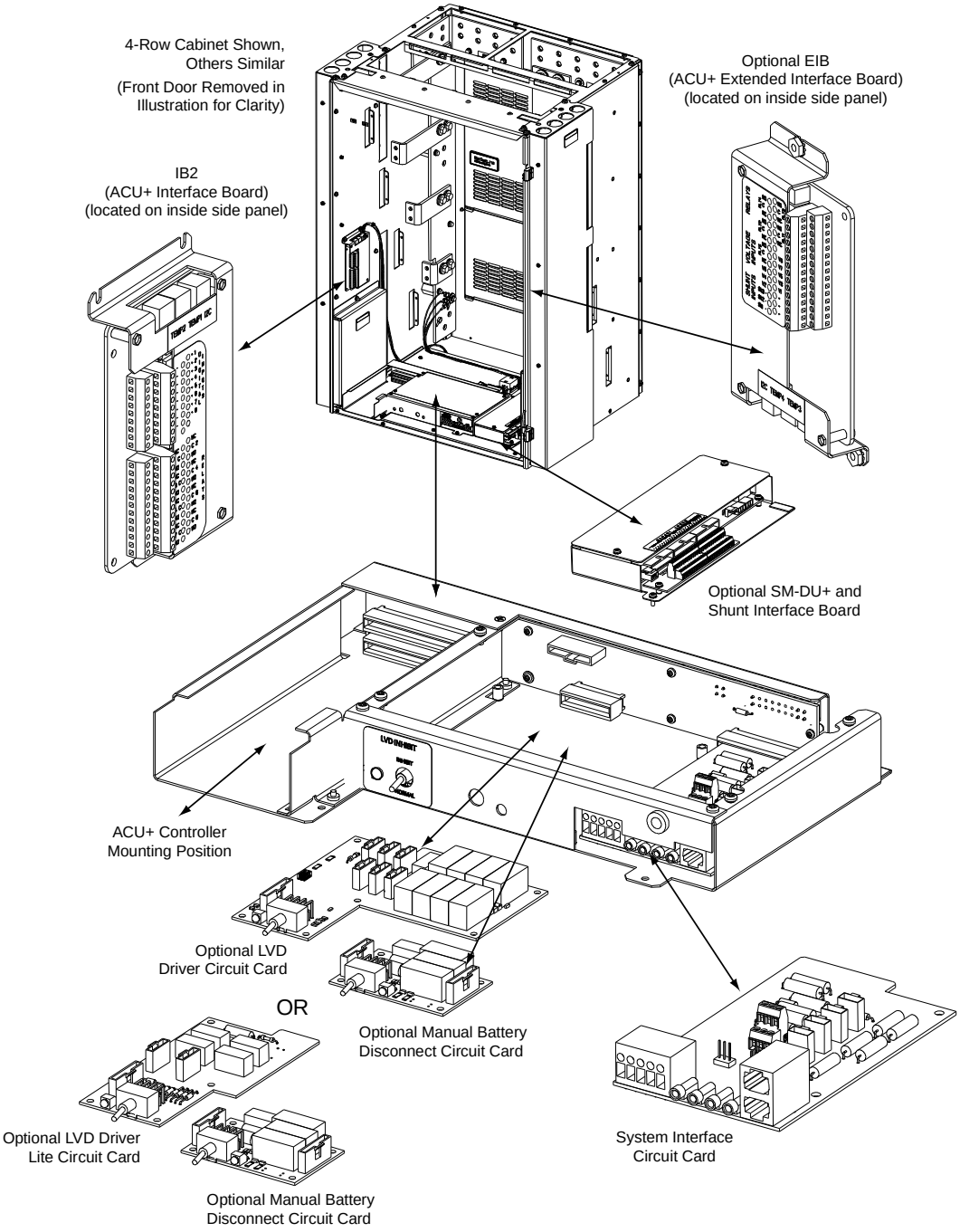

Figure 4-4
Circuit Card Locations

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System Interface Circuit Card

The System Interface Circuit Card provides connections for the following. Refer to Figure 4-5.

- RS-485 (used for communication with SM modules)
- RS-232 (used for communication with a DPU)
- External Battery Monitoring
- External System FA Signal
- External Battery FA Signal
- Battery Tray FA Signal
- System Voltage Monitoring Test Points
- System Load Shunt Monitoring Test Points

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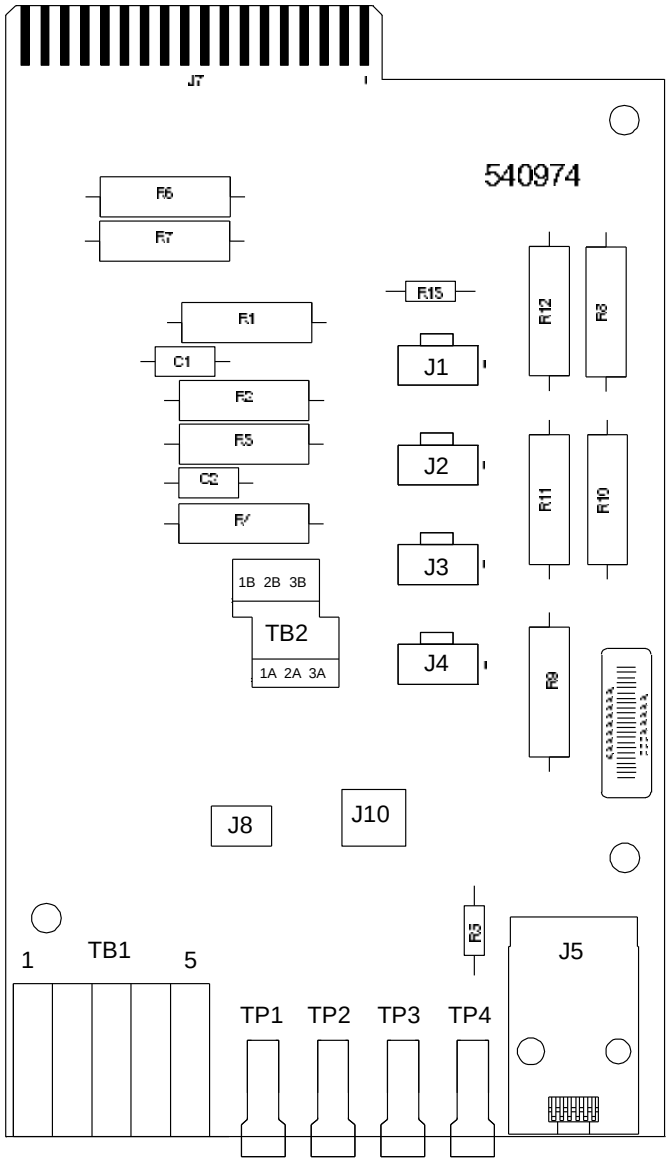


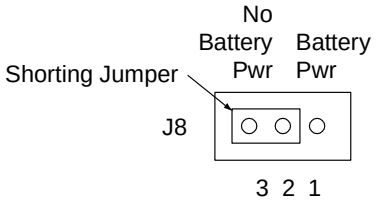
TB2

RS485 Connection
TB2 1A: RS485+
TB2 2A: RS485-

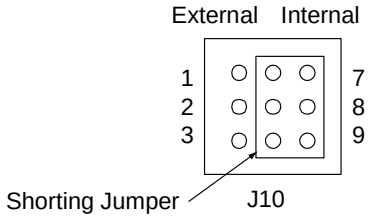
RS232 Connection
TB2 1B: CGND
TB2 2B: TXD232
TB2 3B:RXD232

J1, J2, J3, J4
Distribution Panels FA Inputs

J8
Selects to power Controller from "Battery Power" or not.



J10
Battery Monitoring External / Internal (see TB1-4 and TB1-5 for external monitoring points)



J5
CAN

TB1-1: Battery Tray FA
TB1-2: External Battery FA
TB1-3: External System FA
TB1-4: External Battery Monitoring (-)
TB1-5: External Battery Monitoring (+)

TP1 (+) and TP2 (-)
System Voltage Monitoring

TP3 (+) and TP4 (-)
System Load Shunt Monitoring

TB1
Wire Size Capacity: 22-12 AWG.
Recommended Torque: 3.0 in-lbs.
FA Signals: Battery applied to the terminal turns in an alarm.

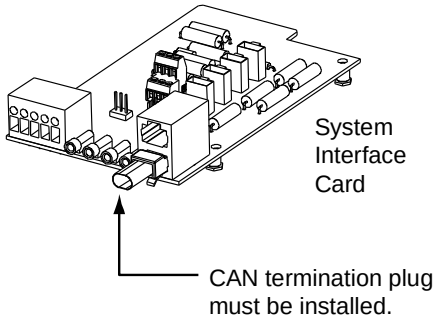


Figure 4-5
System Interface Circuit Card Connections

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IB2 (ACU+ Controller Interface Board)

The IB2 (ACU+ Controller Interface Board) provides connection points for digital inputs, programmable relay outputs, and temperature probes. Refer to Figure 4-6.

Procedure

Digital Inputs and Relay Outputs: Digital input and relay output leads are connected to screw-type terminal blocks located on the IB2 (ACU+ Controller Interface Board) mounted inside the distribution cabinet. Recommended torque for these connections is 5 in-lbs.

a) Digital Inputs: Connect up to eight (8) digital inputs to the IB2 (ACU+ Controller Interface Board). Note that you must supply both paths for the digital input (either a positive or negative signal and the opposite polarity return path). Observe proper polarity.

Note: *+24V is factory wired to the DI8+ terminal for your convenience and function predefined for ESTOP. Customer-furnished system ground applied to terminal DI8- activates the ESTOP function. The ESTOP function shuts down and locks out the rectifiers, opens the LVD's, and shuts down the converters. When the ESTOP signal is removed, LVD's close (if battery present) and converters restart. To restart the rectifiers; turn AC power to the rectifiers OFF, wait 30 seconds or more, then turn AC power to the rectifiers ON. Rectifiers can also be restarted via the Local and Web-interface ACU+ menus using the "rectifier reset" command.*

The digital inputs can be programmed to provide an alarm when the signal is applied (HIGH) or removed (LOW). Refer to the ACU+ User Instructions (UM1M820BNA) for programming information.

b) Programmable Relay Outputs: The IB2 (ACU+ Controller Interface Board) provides eight programmable alarm relays with Form-C contacts.

Note: *The ACU+ relay assigned to "Critical Summary" alarm (relay 1 by default) will operate in the "Fail Safe Mode". "Fail Safe Mode" means Relay 1 is de-energized during an alarm condition, opening the contacts between the C and NO terminals, and closing the contacts between the C and NC terminals.*

The ACU+ remaining 7 relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.

The default ACU+ configuration programs these relays as follows. Refer to the ACU+ User Instructions (UM1M820BNA) for programming information. Refer to *Optional EIB (ACU+ Controller Extended Interface Board)* for relays 9-13, if applicable. Refer to the configuration drawing (C-drawing) supplied with your system for your system's specific configuration.

- Relay 1: Critical Summary Alarm
- Relay 2: Major Summary Alarm
- Relay 3: Over Voltage 1 Alarm
- Relay 4: Under Voltage 1 Alarm
- Relay 5: Under Voltage 2 Alarm
- Relay 6: Mains Failure Alarm
- Relay 7: Fuse Alarm
- Relay 8: Rectifier Major Alarm (single rectifier fail alarm)

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Temperature Probes: Temperature probes are connected to the IB2 (ACU+ Controller Interface Board) and/or optional EIB (ACU+ Controller Extended Interface Board) mounted inside the distribution cabinet.

Note: *Each temperature probe consists of two pieces that plug together to make a complete probe. See SAG581127000 for part numbers and descriptions.*

- Up to two (2) temperature probes can be connected to the IB2 (ACU+ Interface Board). Up to two (2) additional temperature probes can be connected to the optional EIB (ACU+ Extended Interface Board). Any combination of the four (4) temperature probes can be programmed to monitor ambient temperature and/or battery temperature. A temperature probe set as a battery probe can also be designated to be used for the battery charge temperature compensation feature, or the battery charge temperature compensation feature can be programmed to use the average or highest value of all battery temperature probes. The battery charge temperature compensation feature allows the controller to automatically increase or decrease the output voltage of the system to maintain battery float current as battery temperature decreases or increases, respectively. Battery life can be extended when an optimum charge voltage to the battery with respect to temperature is maintained. A temperature probe set as a battery probe can also be used for controlling against battery thermal runaway (BTRM feature). Refer to the ACU+ User Instructions (UM1M820BNA) for programming information.
- The temperature sensor end of the probe contains a tab with a 5/16” clearance hole for mounting.
- A temperature probe programmed to monitor battery temperature should be mounted on the negative post of a battery cell to sense battery temperature. A temperature probe used for battery charge temperature compensation or BTRM (Battery Thermal Runaway Management) should also be mounted on the negative post of a battery cell. A temperature probe programmed to monitor ambient temperature should be mounted in a convenient location, away from direct sources of heat or cold.

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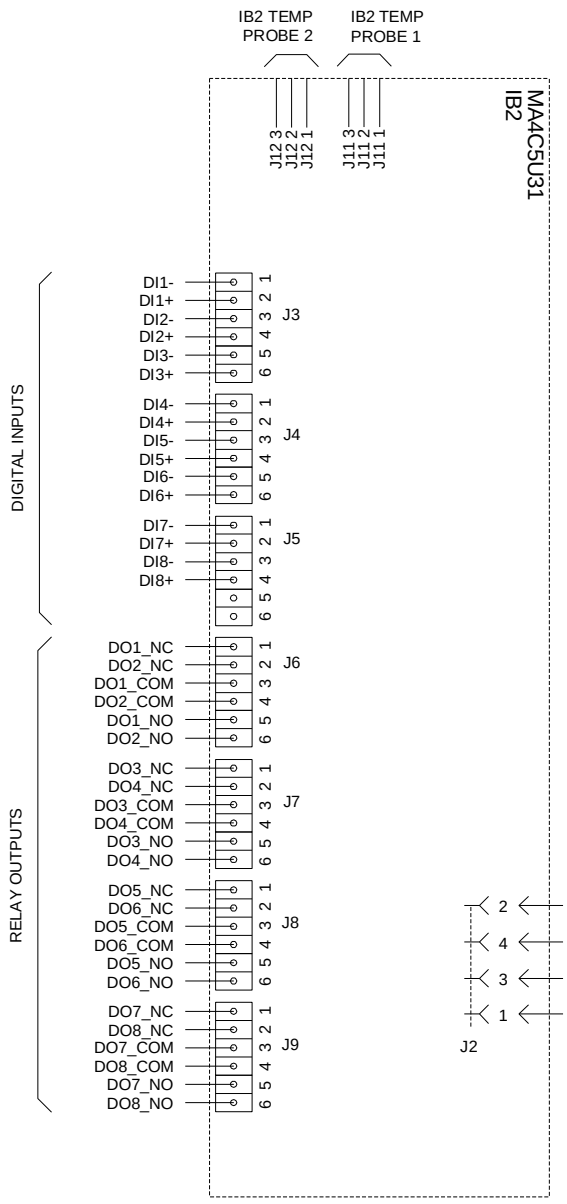
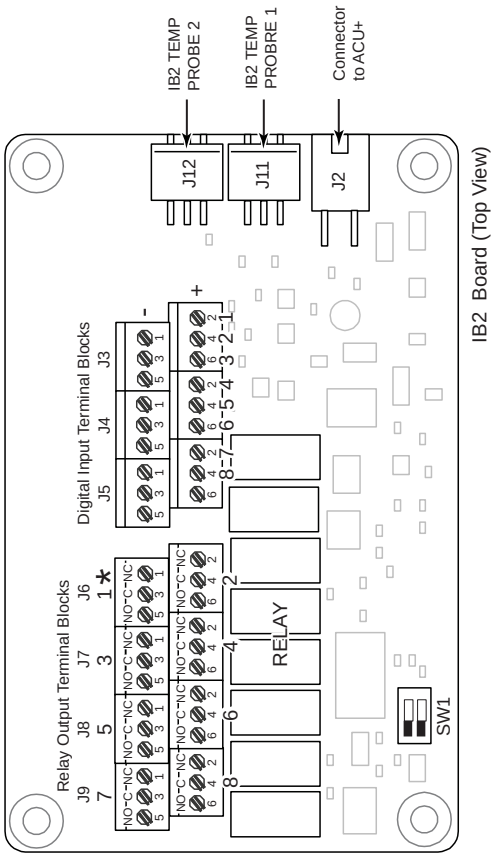
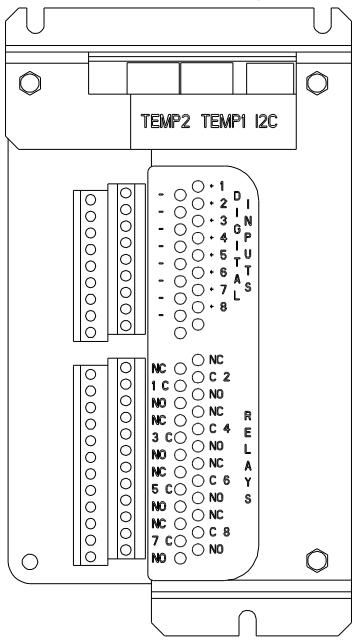
Schematic Diagram of IB2 Board





IB2 Board Assembly



* The ACU+ relay assigned to "Critical Summary" alarm (relay 1 by default) will operate in the "Fail Safe Mode". "Fail Safe Mode" means Relay 1 is de-energized during an alarm condition, opening the contacts between the C and NO terminals, and closing the contacts between the C and NC terminals.

The ACU+'s remaining seven (7) relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.

Not all I/O points are available for customer connection (some are used for factory system connections).

J3-J9:
Wire Size Capacity: 16-26 AWG.
Recommended Torque: 2.2 in-lbs.

Figure 4-6
IB2 (Interface Board) Connections

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Optional EIB (ACU+ Controller Extended Interface Board)

The optional EIB (ACU+ Controller Extended Interface Board) provides additional connection points for voltage and current inputs, programmable relay outputs, and temperature probes. Refer to Figure 4-7.

Procedure

Voltage Inputs, Current Inputs, and Programmable Relay Outputs: Voltage input, current input, and relay output leads are connected to screw-type terminal blocks located on the optional EIB (ACU+ Controller Extended Interface Board) mounted inside the distribution cabinet. Recommended torque for these connections is 5 in-lbs.

a) Current Inputs: Connect up to three (3) shunt inputs to the EIB (Extended Interface Board). Observe proper polarity. Refer to Table 4-2 to determine what shunt input to connect to on the EIB board. Refer to the ACU+ User Instructions (UM1M820BNA) and program the shunt input parameters found in the EIB menu.

Number of Battery Shunts	Number of Load Shunts	Connect to EIB Shunt Inputs as Follows
1	0	Shunt 1 – Battery 1 Shunt 2 – none Shunt 3 – none
2	0	Shunt 1 – Battery 1 Shunt 2 – Battery 2 Shunt 3 – none
3	0	Shunt 1 – Battery 1 Shunt 2 – Battery 2 Shunt 3 – Battery 3
0	1	Shunt 1 – none Shunt 2 – none Shunt 3 – Load 1
0	2	Shunt 1 – none Shunt 2 – Load 2 Shunt 3 – Load 1
0	3	Shunt 1 – Load 3 Shunt 2 – Load 2 Shunt 3 – Load 1
1	1	Shunt 1 – Battery 1 Shunt 2 – none Shunt 3 – Load 1
2	1	Shunt 1 – Battery 1 Shunt 2 – Battery 2 Shunt 3 – Load 1
1	2	Shunt 1 – Battery 1 Shunt 2 – Load 2 Shunt 3 – Load 1

Table 4-2
Shunt Inputs to EIB Interface Board

b) Voltage Inputs for Battery Block and Battery Midpoint Monitoring: The ACU+ can monitor battery blocks (12V blocks) or midpoint battery voltage of battery strings connected to the EIB assembly. The EIB assembly provides a

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total of eight (8) DC voltage inputs for these connections. An alarm is issued when either battery block voltage or battery midpoint voltage is abnormal.

Refer to Figure 4-8 for connection details. Refer to the ACU+ User Instructions (UM1M820BNA) and program the following parameters found in the EIB menu.

- **Battery Block Monitoring**

  Voltage Type: Set to "24 (Block 2)". This selects the EIB to monitor up to four (4) 24V battery strings with two (2) 12V blocks per string

  BlockVDiff(12V): This menu item appears if "24 (Block 2)" is selected above. Set to the alarm threshold for battery block monitoring per site requirements. The ACU+ issues an alarm when any block voltage of any battery string has an abnormal value. The alarm is issued when the difference between any block voltage and a reference voltage is greater than the value of the block voltage difference setting.

  Block In-Use: Set to the number of 12V battery blocks being used.

- **Midpoint Monitoring**

  Voltage Type: Set to "Midpoint". This selects the EIB to monitor the midpoint voltage of up to eight (8) battery strings.

  BlockVDiff(Mid): This menu item appears if "Midpoint" is selected above. Set to the alarm threshold for battery midpoint monitoring per site requirements. The ACU+ issues an alarm when any battery midpoint voltage of any battery string has an abnormal value. The alarm is issued when the difference between any battery midpoint voltage and a reference voltage is greater than the value of the block voltage difference setting.

  Block In-Use: Set to number of 12V battery blocks being used.

c) Programmable Relay Outputs: The EIB (ACU+ Controller Extended Interface Board) provides five programmable alarm relays with Form-C contacts.

Note: *The relays energize during an alarm condition, closing the contacts between the C and NO terminals, and opening the contacts between the C and NC terminals.*

The default ACU+ configuration programs these relays as follows. Refer to the ACU+ User Instructions (UM1M820BNA) for programming information.

- Relay 9: Converter Critical Alarm (multiple converter fail alarms)
- Relay 10: Converter Major Alarm (single converter fail alarm)
- Relay 11: Rectifier Critical Alarm (multiple rectifier fail alarms)
- Relay 12: High 2 Battery Temp Alarm
- Relay 13: Battery Discharge Alarm

Temperature Probes: Temperature probes are connected to the optional EIB (ACU+ Controller Extended Interface Board) mounted inside the distribution cabinet. Refer to "*Temperature Probes*" in the previous section.

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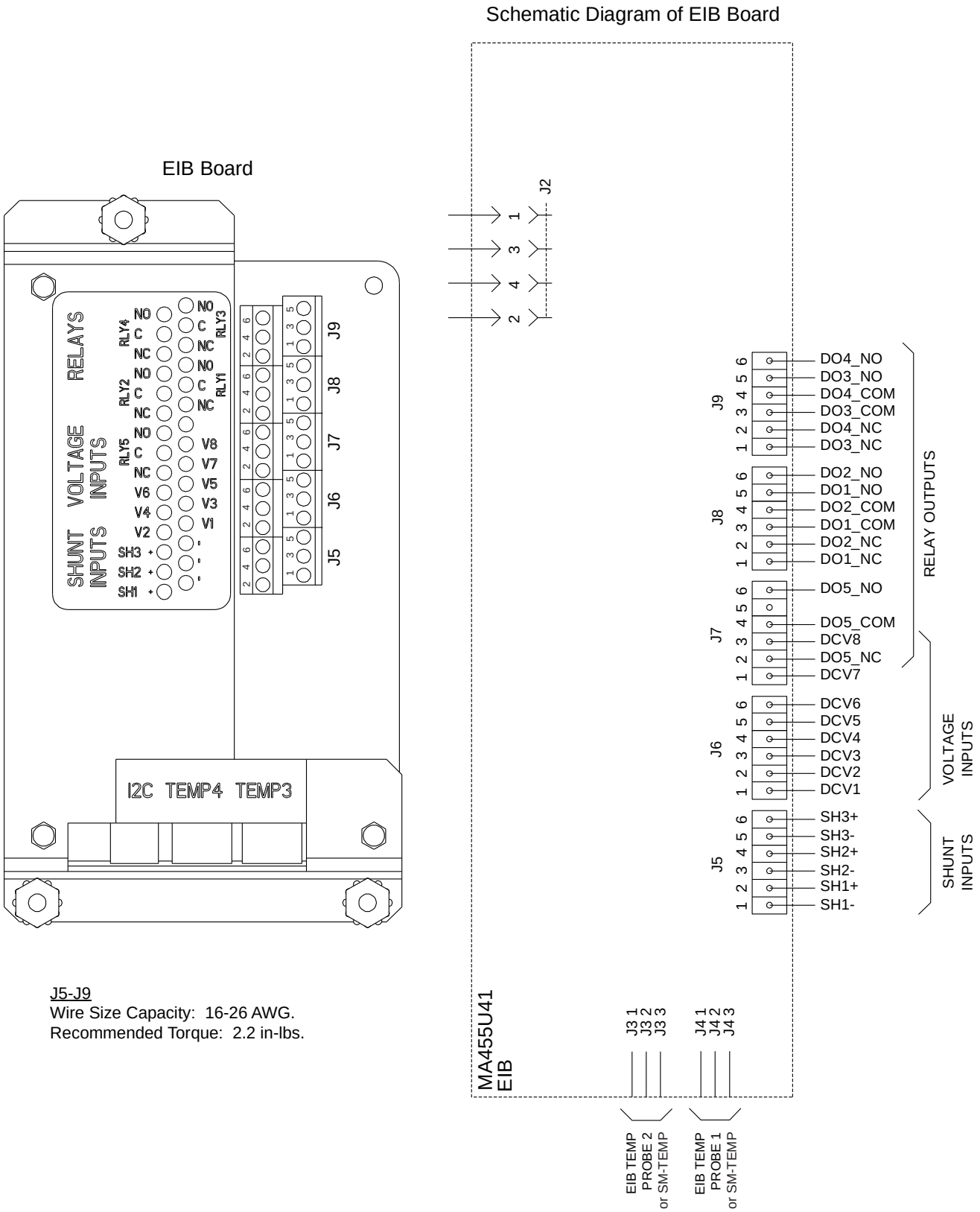

Figure 4-7
EIB (Extended Interface Board) Connections

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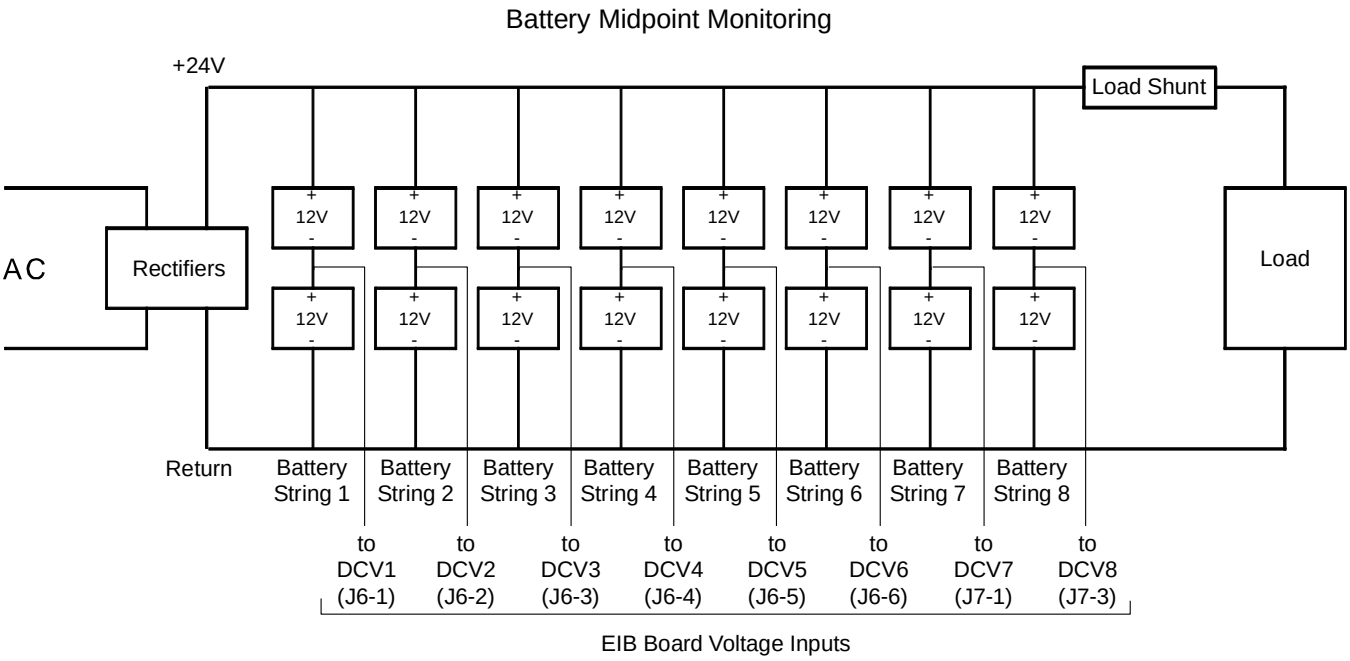

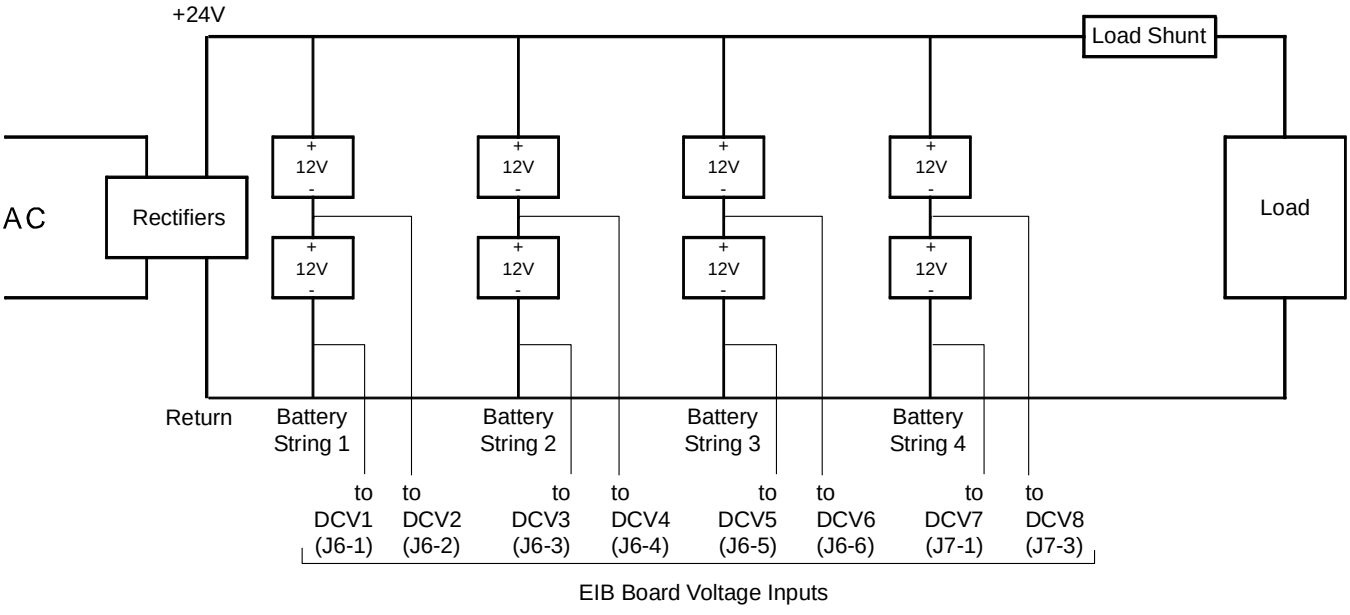

Figure 4-8
Sample Battery Block or Battery Midpoint Monitoring Connections

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Optional SM-DU+ and Shunt Interface Board

The optional SM-DU+ and Shunt Interface Board provides connections for up to twenty-five (25) shunt inputs. Inputs are factory connected to any distribution positions/devices containing shunts. Refer to Figure 4-9.

Procedure

Current Inputs: Connect up to twenty-five (25) shunt inputs to the Shunt Interface Board. Observe proper polarity. Note that some inputs may be factory connected, depending on distribution devices installed. Refer to the ACU+ User Instructions (UM1M820BNA) for programming information for the unused inputs.

Note: *The shunt needs to be installed in the hot (+24V) bus. Connect the plus side of the shunt to the positive shunt input on the SM-DU+. Connect the negative side of the shunt to the negative shunt input on the SM-DU+.*

Optional SM-Temp Module

The analog output of the SM-Temp Module may be connected to an ACU+ temperature port input. In lieu of connecting the analog output of the SM-TEMP module to an ACU+ temperature port input, the SM-TEMP module can simply be connected at the end of the ACU+ CAN bus (requires ACU+ version 3.02 or later). Refer to the SM-Temp Module Installation and User instructions (UM547490) for details.

CAN Bus Procedure

Remove the CAN termination plug from the bottom CAN connector on the System Interface circuit card. Connect the SM-Temp Module CAN bus to the bottom CAN connector on the System Interface circuit card. Refer to Table 4-3 for pin-outs. Ensure the last SM-Temp Module (or if only one) has a CAN termination strap as shown in the SM-Temp Module Installation and User instructions (UM547490).

System Interface Circuit Card CAN Port Pin Number	SM-Temp Module CAN Port Pin Number
1 (CAN L)	TB1-3 (CAN L)
2 (CAN H)	TB1-3 (CAN H)
3	--
4	--
5	--
6	--
7	--
8	--

Table 4-3
CAN Connections

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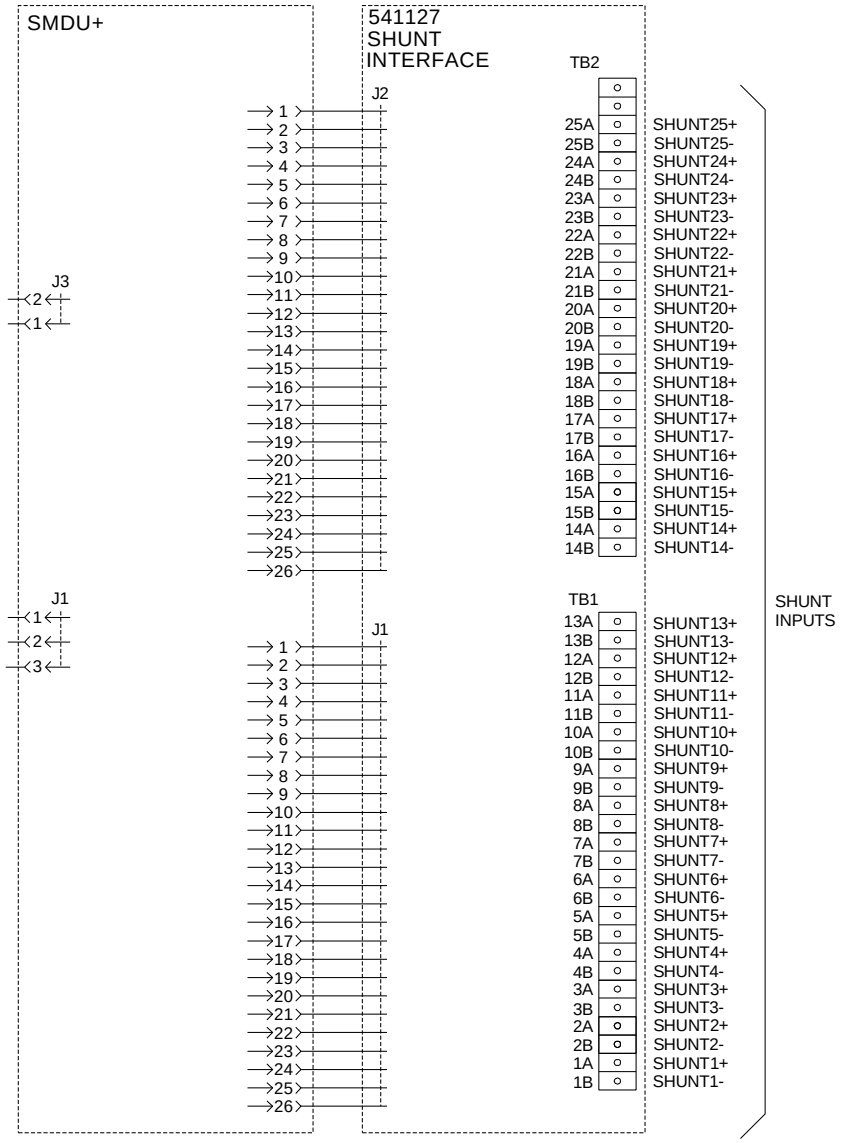
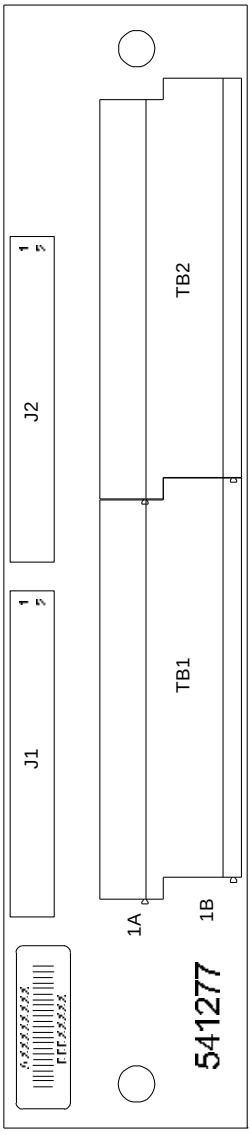
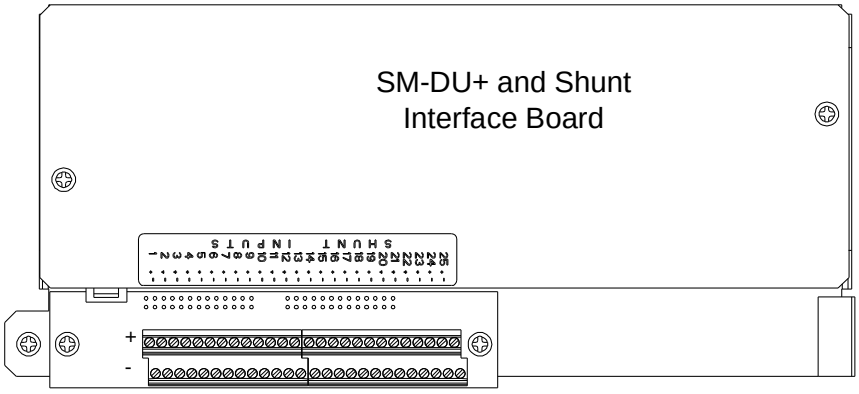
Schematic Diagram of SM-DU+ and Shunt Interface Board



Shunt Interface Board





TB1 - TB2
Wire Size Capacity: 16-26 AWG.
Recommended Torque: 2.2 in-lbs.

Figure 4-9
SM-DU+ and Shunt Interface Board Connections

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ETHERNET CONNECTION

Note: *If the Web Interface is not being used with this system, skip this procedure.*

The ACU+ provides a Web Interface via an Ethernet connection to a TCP/IP network. An RJ-45 10BaseT jack is provided on the front of the ACU+ for connection into a customer's network running TCP/IP. This jack has a standard Ethernet pin configuration scheme, twisted pair. Refer to Figure 4-10 for location and Table 4-4 for pin outs. Use shielded Ethernet cable (grounded at both ends). Note that the ACU+ RJ-45 jack is connected to chassis ground. Refer to the ACU+ User Instructions (UM1M820BNA) for operational details.

Note: *You can access the Web pages of the power system locally by using a "crossover" or "straight" cable connected directly between your PC and the ACU+.*

Warning: *The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallically connected to the interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.*

The intra-building port (RJ-45) of the equipment or subassembly must use shielded intra-building cabling/wiring that is grounded at both ends.

Port Pin Number	Name	Definition
1	Tx+	Write Signal +
2	Tx-	Write Signal -
3	Rx+	Read Signal +
4	--	no connection
5	--	no connection
6	Rx-	Read Signal -
7	--	no connection
8	--	no connection

Table 4-4
ACU+ RJ-45 Ethernet Port Pin Configuration

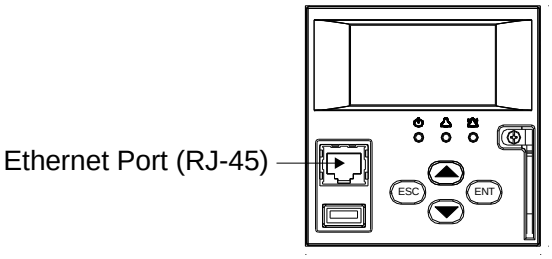

Figure 4-10
ACU+ Ethernet Port

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CONTROL BUS CONNECTIONS BETWEEN CONTROLLER AND MODULE MOUNTING SHELVES

Each module mounting shelf in the system is daisy-chained to the controller. A connector is located at the top of each shelf and another at the bottom of each shelf. These connectors are used to interconnect the shelves to the controller. Refer to Figure 4-11 for connector locations. These connections are factory made for shelves factory installed. The connection must be made if a field expansion shelf is installed as shown in Figure 4-11.

- The top connector of the top most module mounting assembly connects to the controller.
- The bottom connector of a shelf plugs into the top connector on the shelf below it.
- The bottom connector on the bottom most shelf must have the termination connector.

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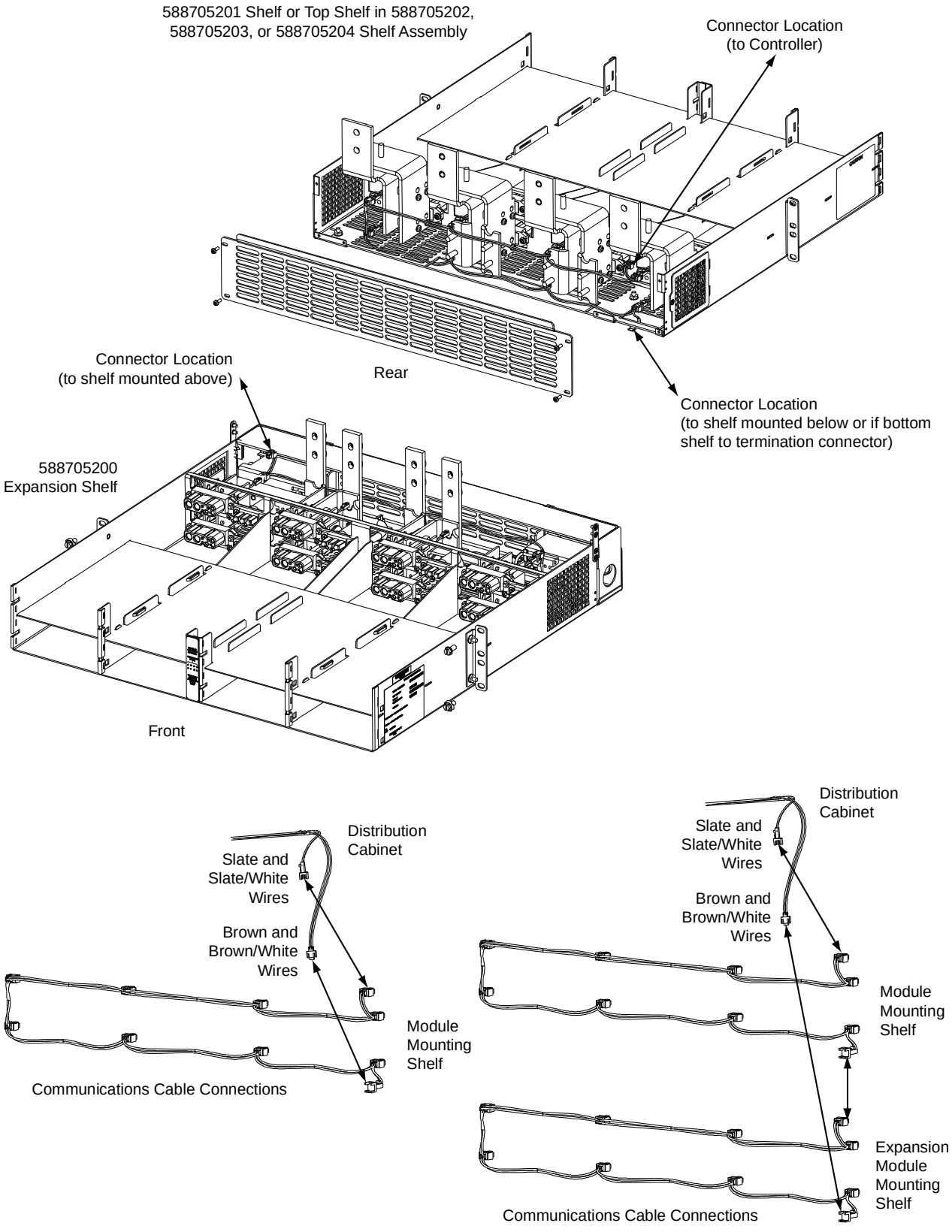
588705201 Shelf or Top Shelf in 588705202, 588705203, or 588705204 Shelf Assembly
Connector Location (to Controller)
Rear
Connector Location (to shelf mounted above)
Connector Location (to shelf mounted below or if bottom shelf to termination connector)
588705200 Expansion Shelf
Front
Distribution Cabinet
Slate and Slate/White Wires
Brown and Brown/White Wires
Module Mounting Shelf
Communications Cable Connections
Distribution Cabinet
Slate and Slate/White Wires
Brown and Brown/White Wires
Module Mounting Shelf
Expansion Module Mounting Shelf
Communications Cable Connections

Figure 4-11
Control Bus Connections between Controller and Module Mounting Shelves

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CONNECTING LIST 60 CONVERTER OUTPUT JUMPERS

Note: *If List 60 is not provided, skip this procedure.*

Note: *If the power system was ordered in a relay rack, this procedure has been performed at the factory.*

Procedure

1) Locate the output jumpers (labeled -48V) supplied with List 60 (P/O kit P/N 540860). There are two (2) cables per List 60.
2) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
3) Loosen the (2) screws holding the plastic shield over the circuit breakers or fuseholders on the dual voltage distribution panel. Slide the shield upwards and remove.
4) Connect the output jumpers to the distribution bus panel subsystem (-48V) input terminals as shown in Figure 4-12. Apply electrical anti-oxidizing compound to lug mating surfaces before connecting. Mount two lugs back-to-back per mounting position if required. Torque as shown in the figure.
5) Route the output jumpers installed in the previous step over the top of the distribution bus panel ground bar, toward the back of the cabinet, and down through the opening in the bottom of the distribution cabinet (between the cabinet main busbars).
6) Route the output jumpers to the converter output terminals as shown in Figure 4-12.
7) Connect the output jumpers to the converter output terminals as shown in Figure 4-12. Apply electrical anti-oxidizing compound to lug mating surfaces before connecting. Torque as shown in the figure.
8) Install the plastic shield that was removed in a previous step, over the circuit breakers or fuseholders. To do so, position the shield and slide downwards on screws. Tighten screws.

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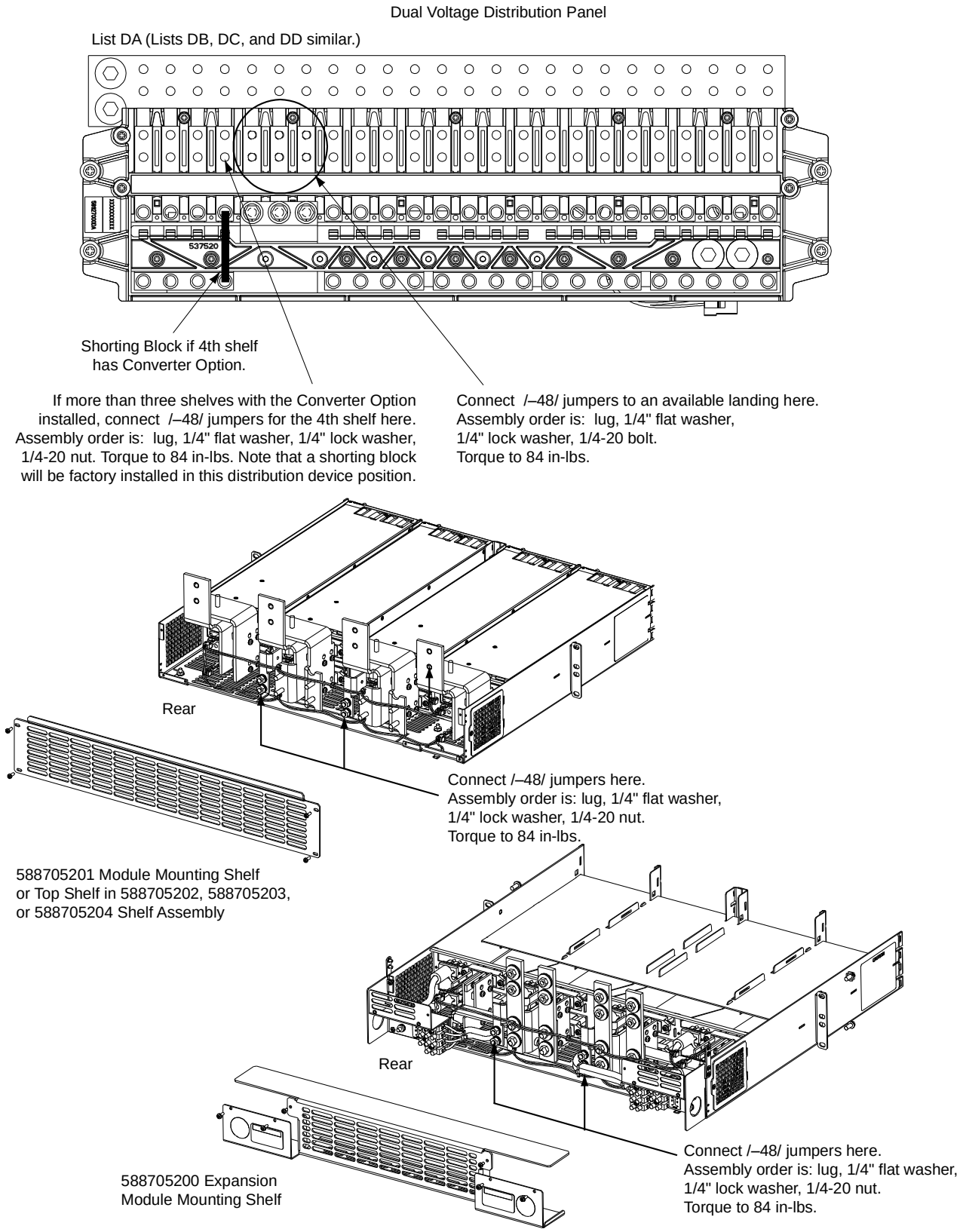
Dual Voltage Distribution Panel
List DA (Lists DB, DC, and DD similar.)
537520
Shorting Block if 4th shelf has Converter Option.
If more than three shelves with the Converter Option installed, connect /–48/ jumpers for the 4th shelf here. Assembly order is: lug, 1/4" flat washer, 1/4" lock washer, 1/4-20 nut. Torque to 84 in-lbs. Note that a shorting block will be factory installed in this distribution device position.
Connect /–48/ jumpers to an available landing here. Assembly order is: lug, 1/4" flat washer, 1/4" lock washer, 1/4-20 bolt. Torque to 84 in-lbs.
Rear
Connect /–48/ jumpers here. Assembly order is: lug, 1/4" flat washer, 1/4" lock washer, 1/4-20 nut. Torque to 84 in-lbs.
588705201 Module Mounting Shelf or Top Shelf in 588705202, 588705203, or 588705204 Shelf Assembly
Rear
Connect /–48/ jumpers here. Assembly order is: lug, 1/4" flat washer, 1/4" lock washer, 1/4-20 nut. Torque to 84 in-lbs.
588705200 Expansion Module Mounting Shelf

Figure 4-12
Installing Converter Output Cables

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LOAD CONNECTIONS

Loads are connected to the various distribution panels located inside the distribution cabinet, as detailed in this section.

Recommended Torques

- 72 in-lbs for 1/4-inch hardware (when using standard flat and lock washer).
- 300 in-lbs for 3/8-inch hardware (when using standard flat and lock washer).

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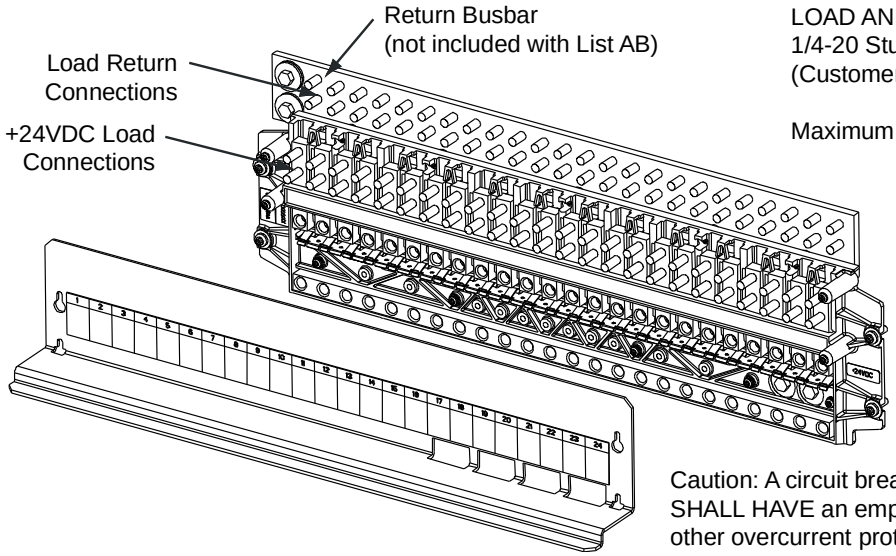
Load Connections to Single Voltage Distribution Panels

List AA: +24V Distribution Panel (with Return Busbar) and
List AB: +24V Distribution Panel (without Return Busbar),
(24) Bullet/TPS/TLS Circuit Breaker/Fuse Positions



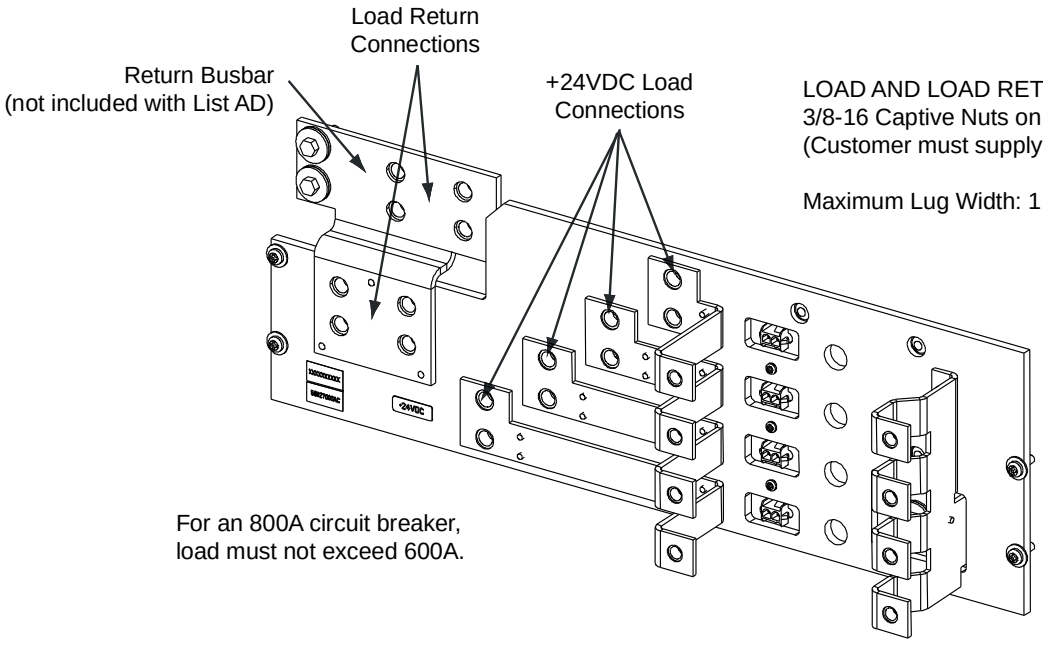
LOAD AND LOAD RETURN CONNECTIONS
1/4-20 Studs on 5/8” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 0.625 inches.

WARNING!
Observe proper polarity when making load connections.

Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

List AC: +24V Distribution Panel (with Return Busbar) and
List AD: +24V Distribution Panel (without Return Busbar),
(4) GJ/218 Circuit Breaker Positions



LOAD AND LOAD RETURN CONNECTIONS
3/8-16 Captive Nuts on 1” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.375 inches.

WARNING!
Observe proper polarity when making load connections.

For an 800A circuit breaker, load must not exceed 600A.

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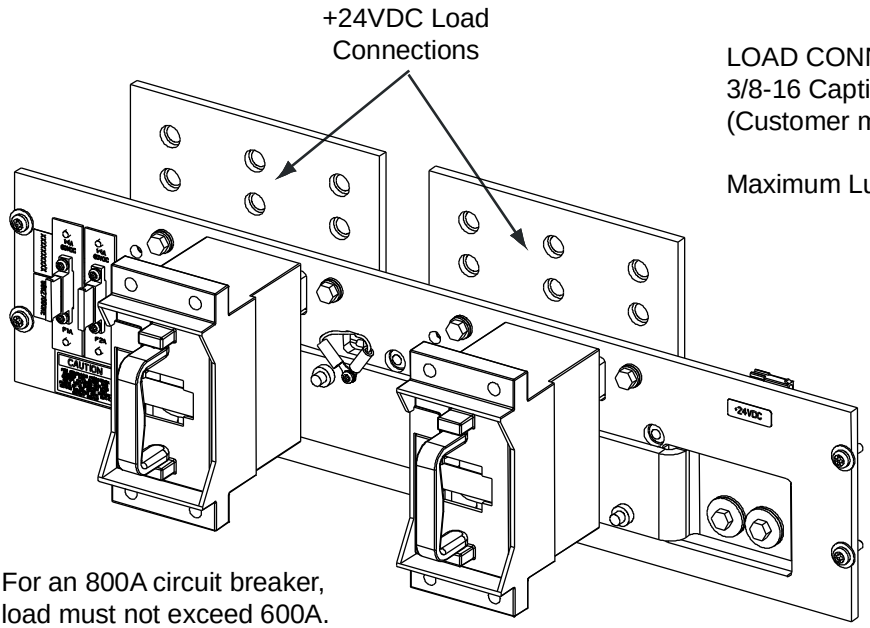
List AE: +24V Distribution Panel,
(2) TPH Fuse Positions (without Shunts) (without Return Busbar)



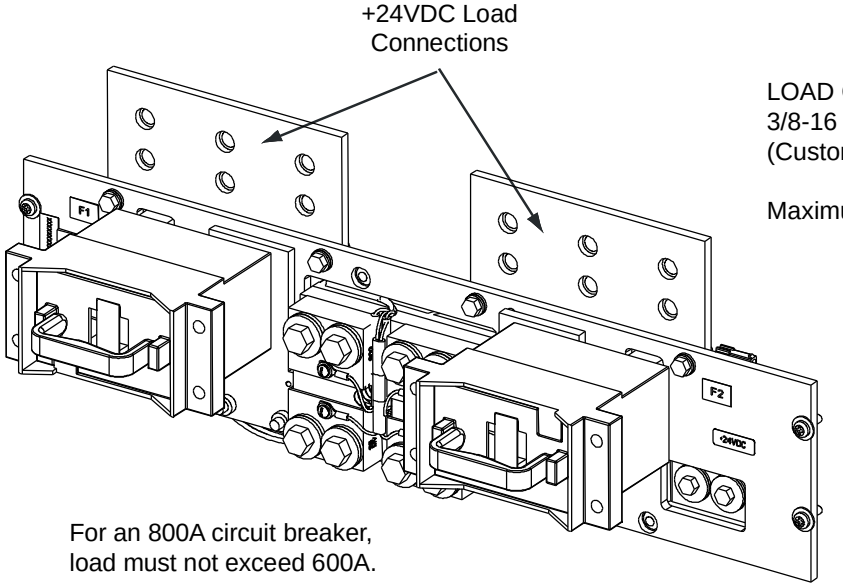
LOAD CONNECTIONS
3/8-16 Captive Nuts on 1” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.88 inches.

WARNING!
Observe proper polarity when making load connections.

For an 800A circuit breaker, load must not exceed 600A.

List AF: +24V Distribution Panel,
(2) TPH Fuse Positions (with Shunts) (without Return Busbar)



LOAD CONNECTIONS
3/8-16 Captive Nuts on 1” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.88 inches.

WARNING!
Observe proper polarity when making load connections.

For an 800A circuit breaker, load must not exceed 600A.

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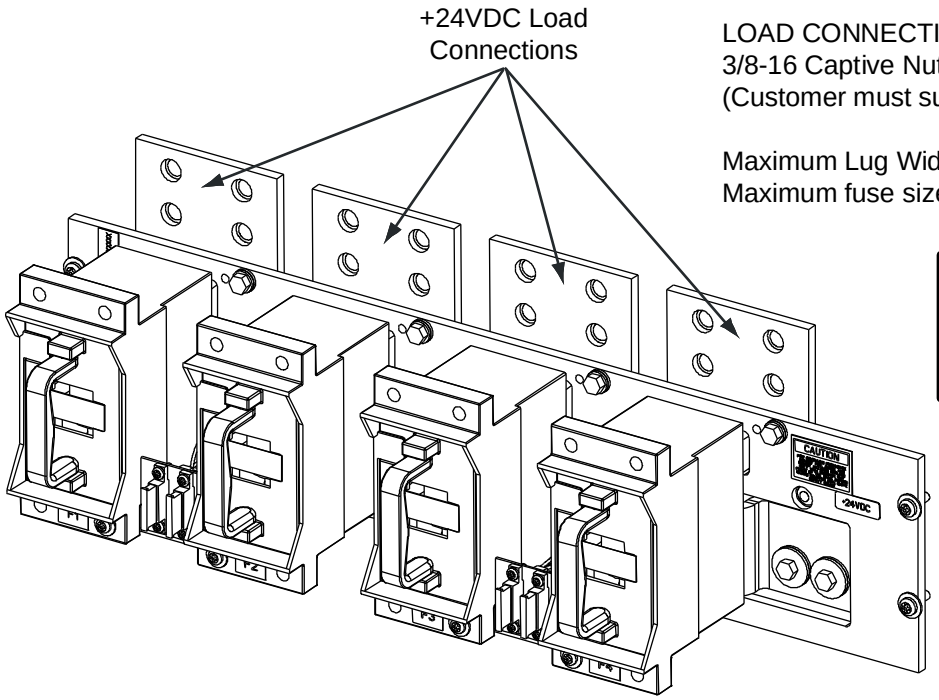
List AG: +24V Distribution Panel,
(4) TPH Fuse Positions (without Shunts) (without Return Busbar)

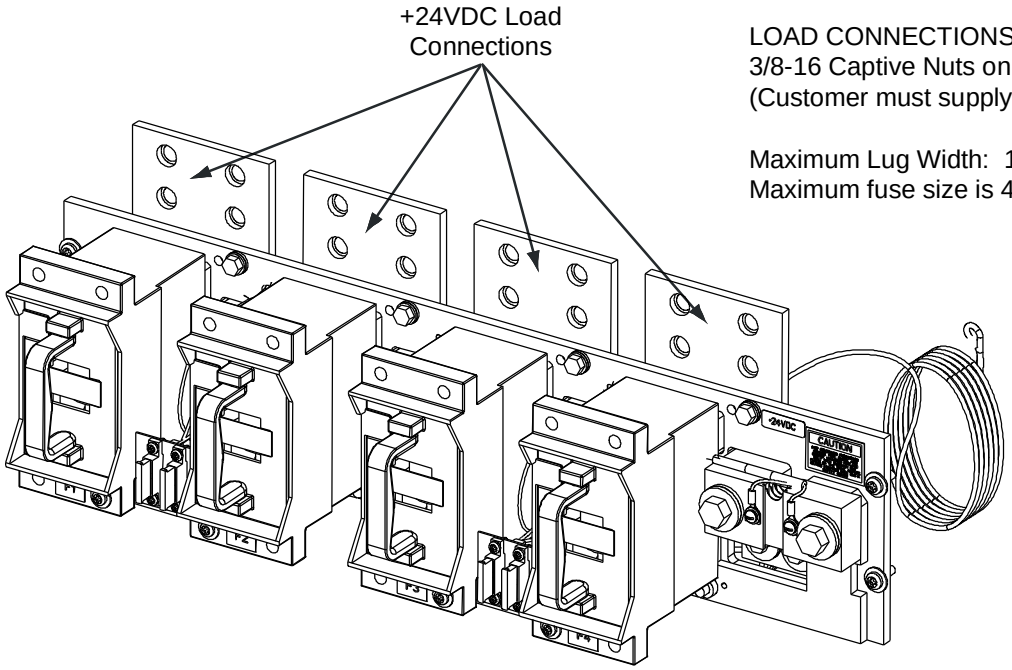


LOAD CONNECTIONS
3/8-16 Captive Nuts on 1” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.75 inches.
Maximum fuse size is 400A.

WARNING!
Observe proper polarity when making load connections.

List AH: +24V Distribution Panel,
(4) TPH Fuse Positions (with Shunts) (without Return Busbar)



LOAD CONNECTIONS
3/8-16 Captive Nuts on 1” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.75 inches.
Maximum fuse size is 400A.

WARNING!
Observe proper polarity when making load connections.

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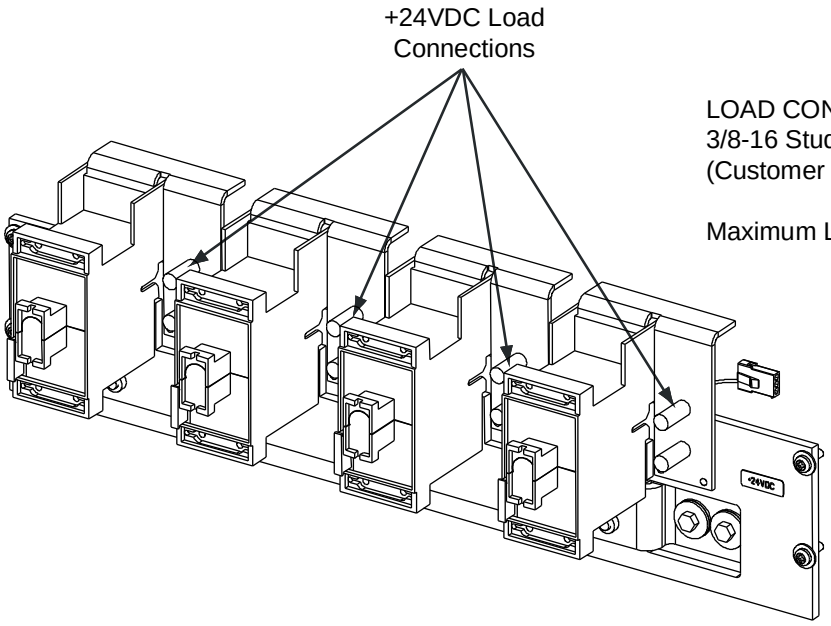
List AJ: +24V Distribution Panel,
(4) TPL-B Fuse Positions (without Shunts) (without Return Busbar)

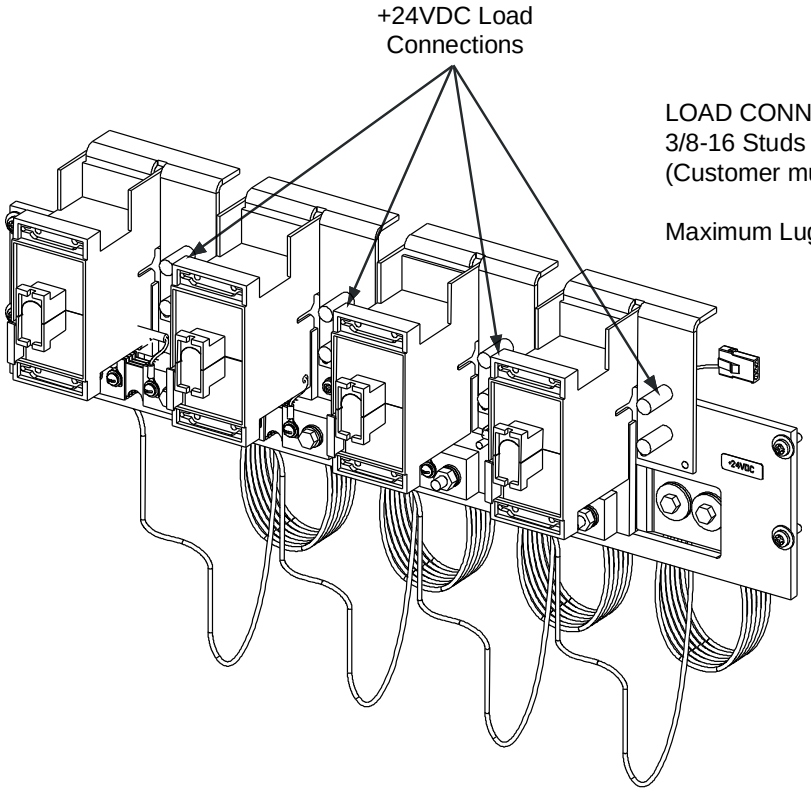


LOAD CONNECTIONS
3/8-16 Studs on 1" Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.5 inches.

WARNING!
Observe proper polarity when making load connections.

List AK: +24V Distribution Panel,
(4) TPL-B Fuse Positions (with Shunts) (without Return Busbar)



LOAD CONNECTIONS
3/8-16 Studs on 1" Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.5 inches.

WARNING!
Observe proper polarity when making load connections.

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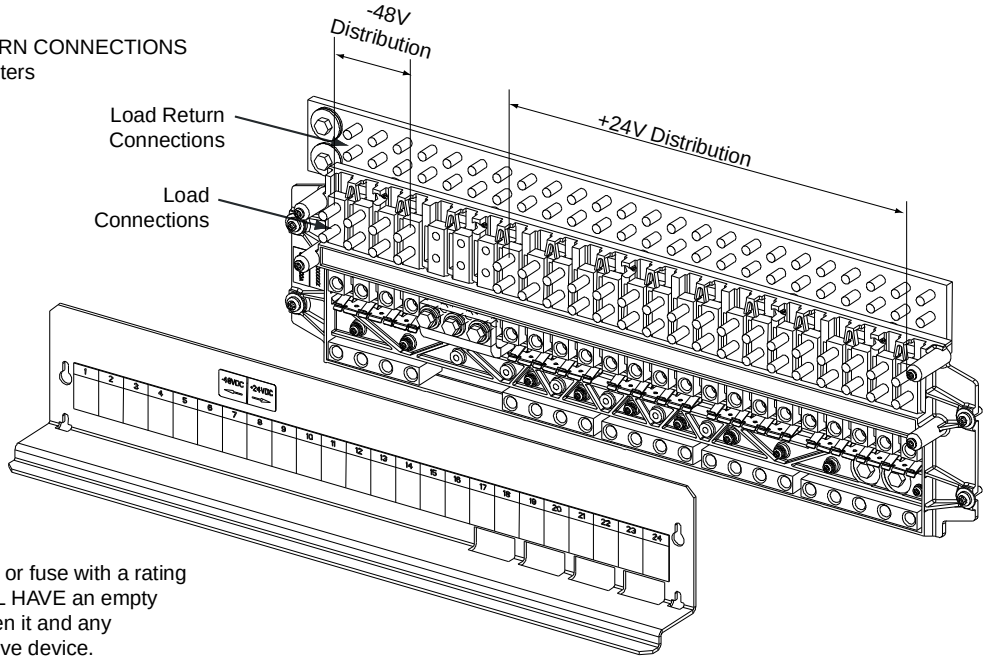
Load Connections to Dual Voltage Distribution Panels

List DA: +24V/-48V Distribution Panel, (17) +24V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (4) –48V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

LOAD AND LOAD RETURN CONNECTIONS
1/4-20 Studs on 5/8” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 0.625 inches.

WARNING!
Observe proper polarity when making load connections.



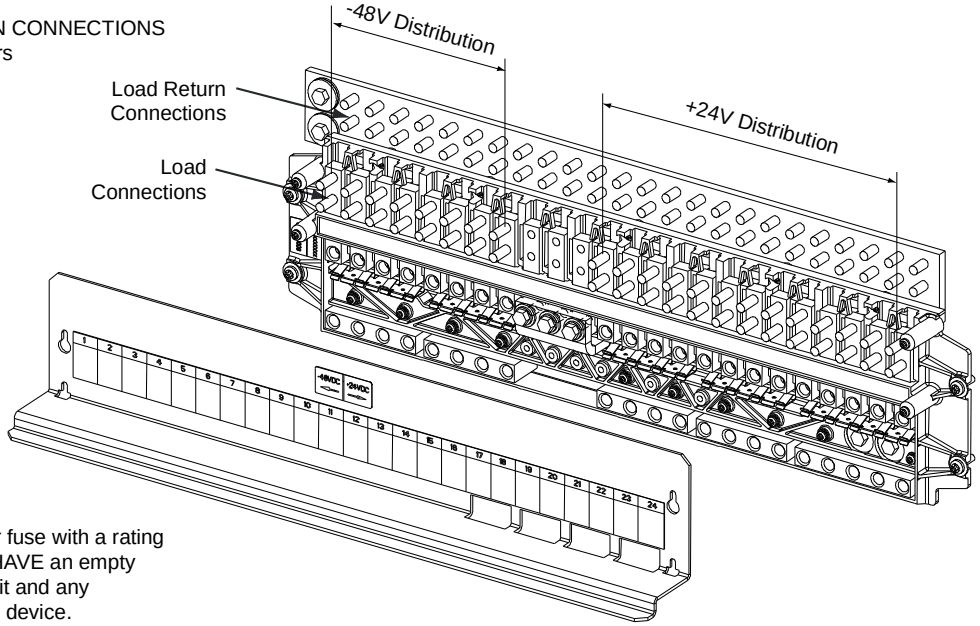
Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

List DB: +24V/-48V Distribution Panel, (13) +24V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (8) –48V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

LOAD AND LOAD RETURN CONNECTIONS
1/4-20 Studs on 5/8” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 0.625 inches.

WARNING!
Observe proper polarity when making load connections.



Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

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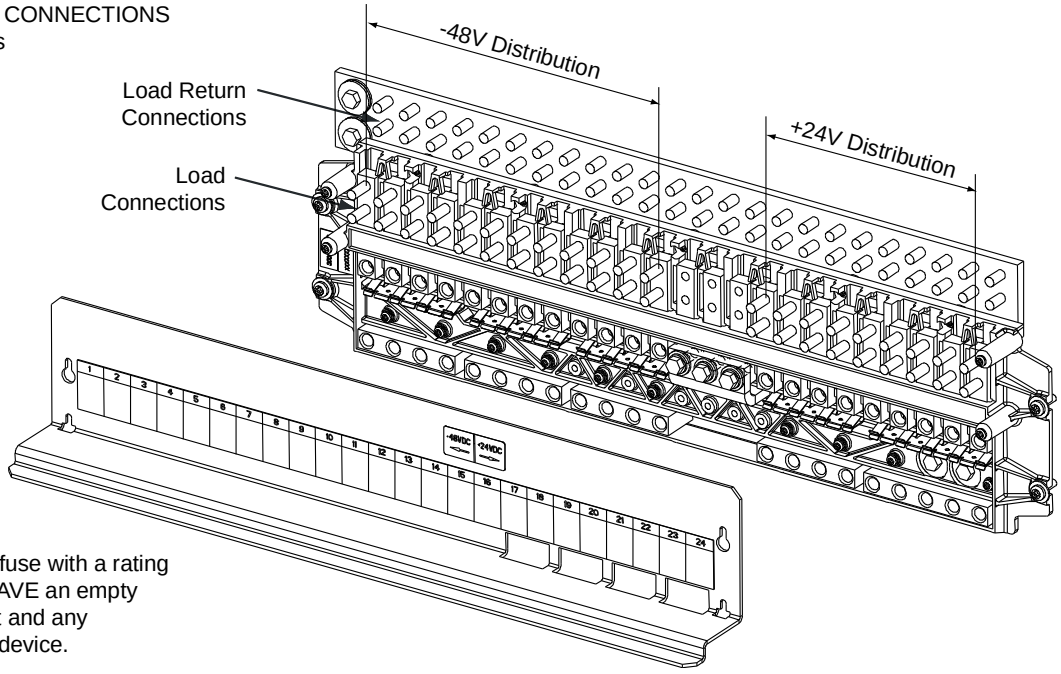
List DC: +24V/-48V Distribution Panel, (9) +24V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (12) –48V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

LOAD AND LOAD RETURN CONNECTIONS
1/4-20 Studs on 5/8” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 0.625 inches.

WARNING!
Observe proper polarity when making load connections.



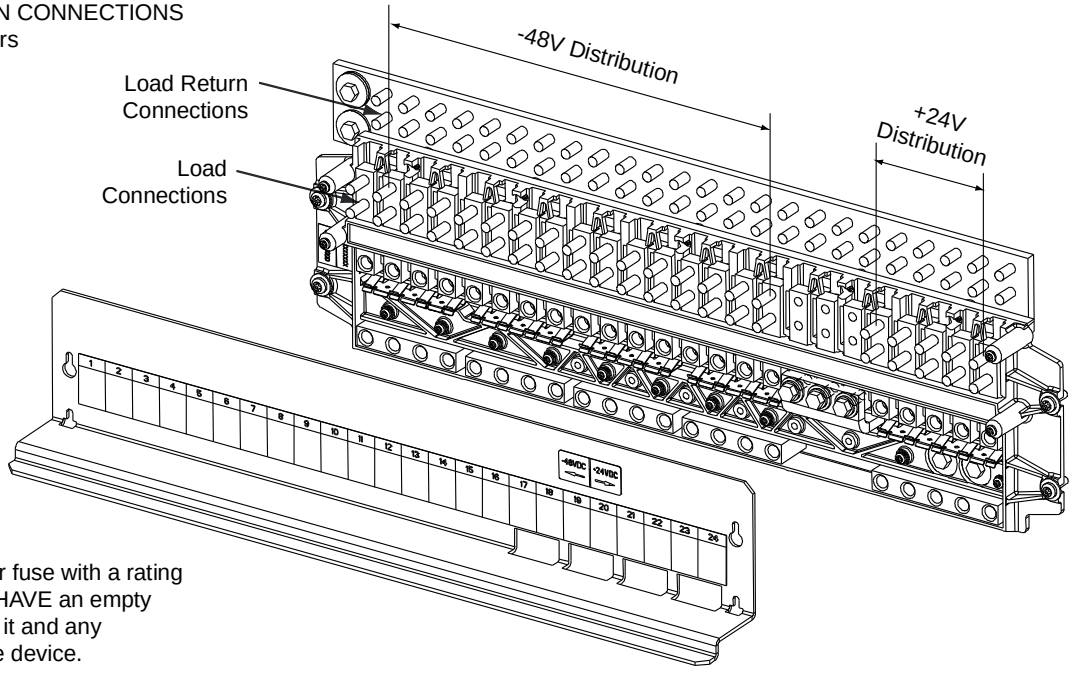
Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

List DD: +24V/-48V Distribution Panel, (5) +24V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar) and (16) –48V Bullet/TPS/TLS Circuit Breaker/Fuse Positions (with Return Busbar)

LOAD AND LOAD RETURN CONNECTIONS
1/4-20 Studs on 5/8” Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 0.625 inches.

WARNING!
Observe proper polarity when making load connections.



Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

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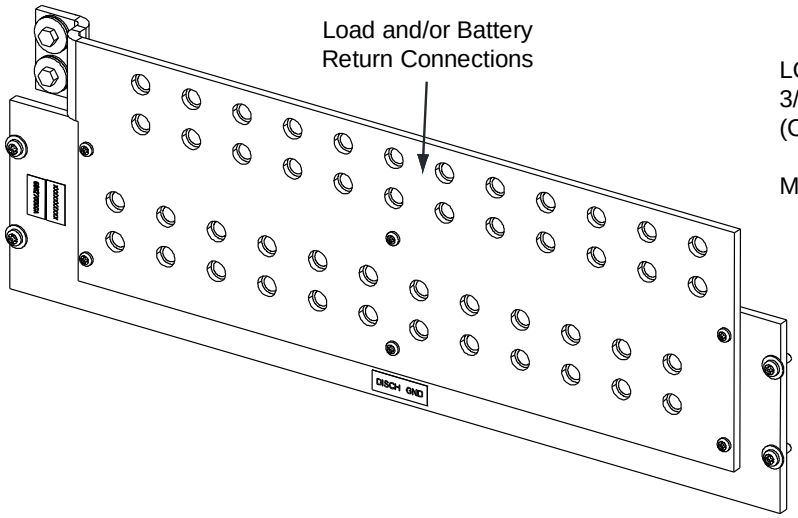
Load Connections to Return Bar

List GA: Return Bar Panel

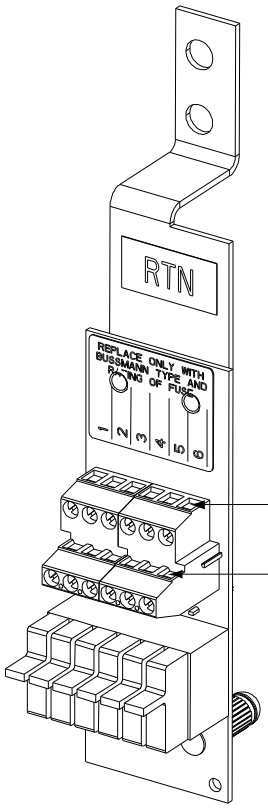


LOAD AND/OR BATTERY RETURN CONNECTIONS
3/8-16 Captive Nuts on 1" Centers
(Customer must supply or order additional hardware)

Maximum Lug Width: 1.38 inches.

Load Connections to GMT Distribution Fuse Block

Optional Bullet Nose 6-Position GMT Distribution Fuse Block



Wire Size Capacity: 26-14 AWG.
Recommended Torque: 4.5 in-lbs.
35A maximum capacity per block.
Maximum GMT fuse size is 15A.

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BATTERY CONNECTIONS

Important Safety Instructions

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

Warning: Observe proper polarity when making battery connections.

Recommended Torques

- 72 in-lbs for 1/4-inch hardware (when using standard flat and lock washer).
- 300 in-lbs for 3/8-inch hardware (when using standard flat and lock washer).
- 180 in-lbs for 3/8-inch hardware (when using a Belleville lock washer).

Battery Connections to Optional Battery Disconnect Distribution Panels

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

Battery strings are connected to the various battery disconnect distribution panels (if furnished) located inside the distribution cabinet, as detailed in the illustrations in this section.

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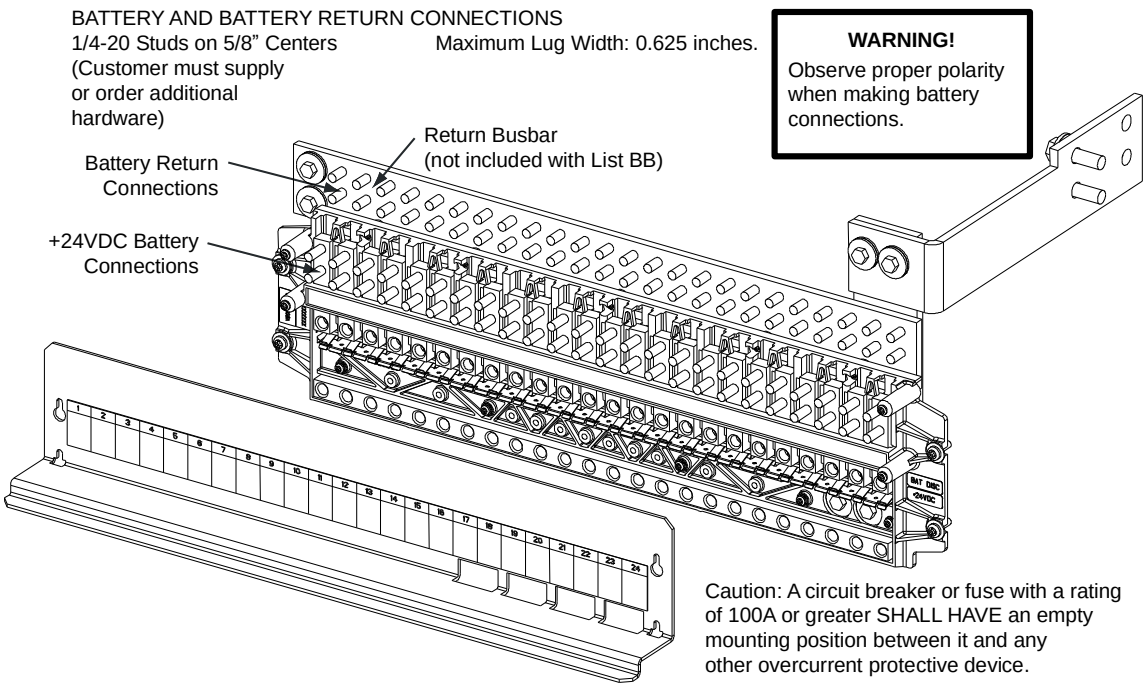
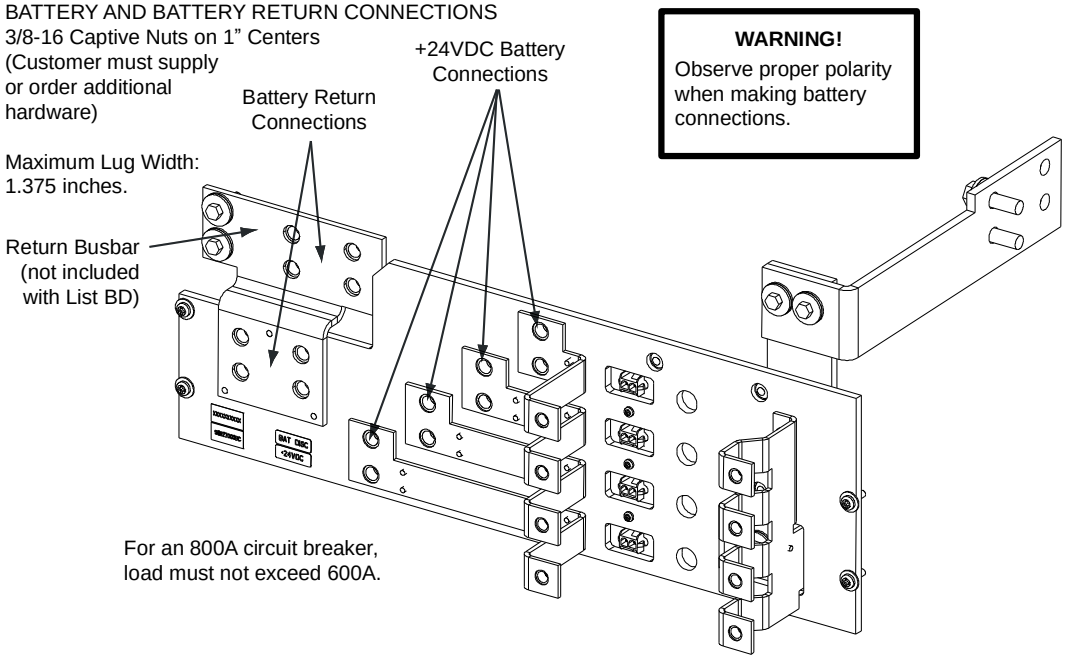
List BA: Battery Disconnect Distribution Panel (with Return Busbar) and List BB: Battery Disconnect Distribution Panel (without Return Busbar), (24) Bullet/TPS/TLS Circuit Breaker/Fuse Battery Disconnect Positions


BATTERY AND BATTERY RETURN CONNECTIONS
1/4-20 Studs on 5/8" Centers
(Customer must supply
or order additional
hardware)
Maximum Lug Width: 0.625 inches.
WARNING!
Observe proper polarity when making battery connections.
Return Busbar
(not included with List BB)
Battery Return
Connections
+24VDC Battery
Connections
Caution: A circuit breaker or fuse with a rating of 100A or greater SHALL HAVE an empty mounting position between it and any other overcurrent protective device.

List BC: Battery Disconnect Distribution Panel (with Return Busbar) and List BD: Battery Disconnect Distribution Panel (without Return Busbar), (4) GJ/218 Circuit Breaker Battery Disconnect Positions



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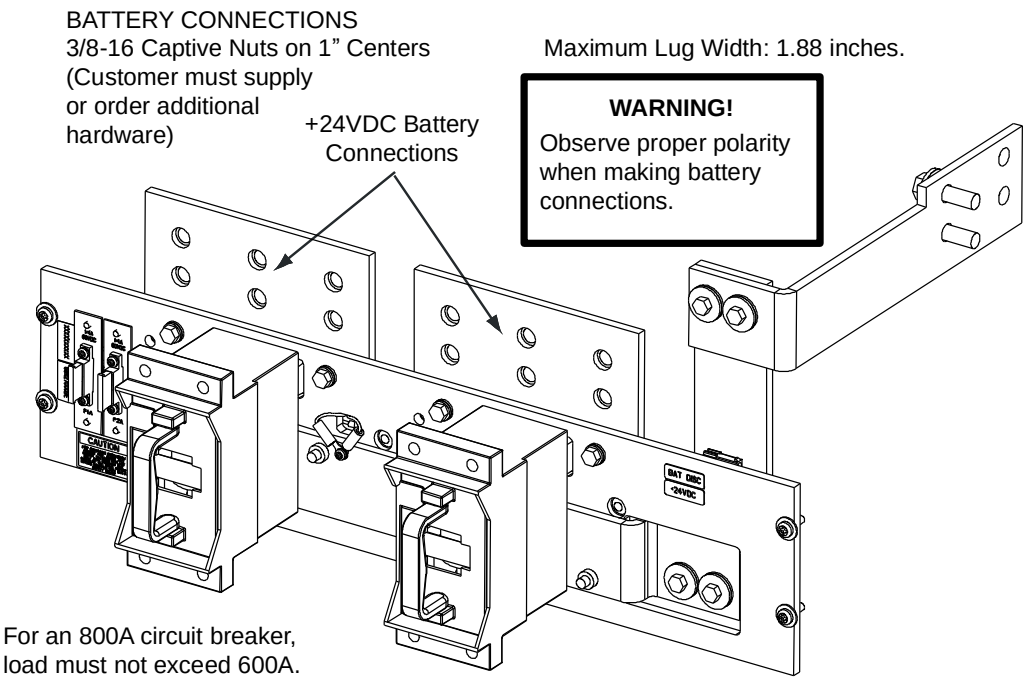
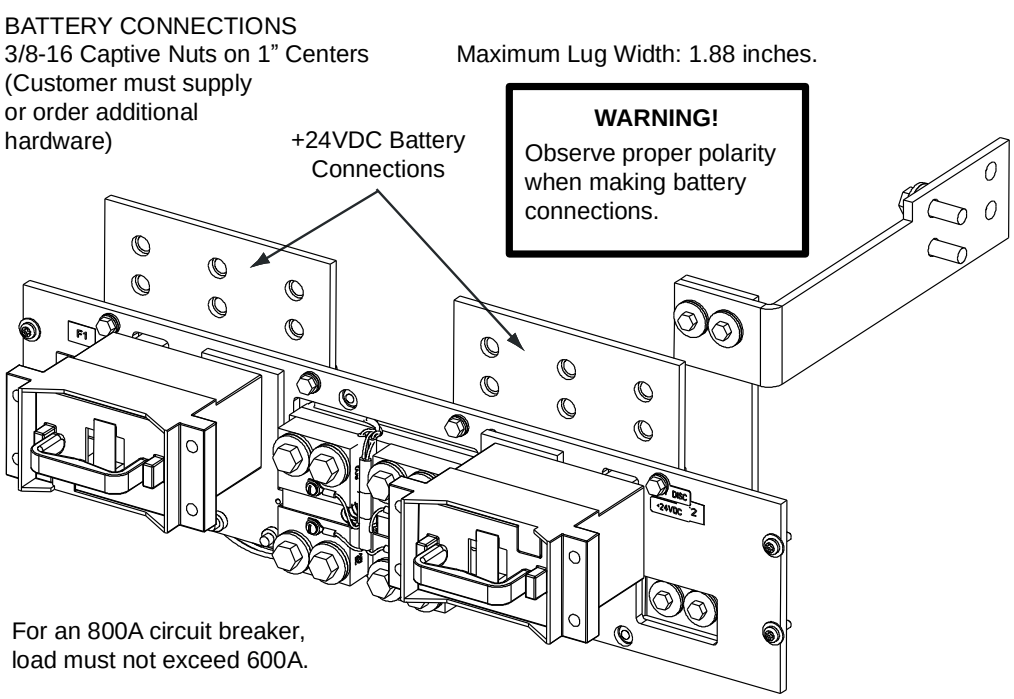
List BE: Battery Disconnect Distribution Panel, (2) TPH Fuse Battery Disconnect Position (without Shunts) (without Return Busbar)



List BF: Battery Disconnect Distribution Panel, (2) TPH Fuse Battery Disconnect Positions (with Shunts) (without Return Busbar)



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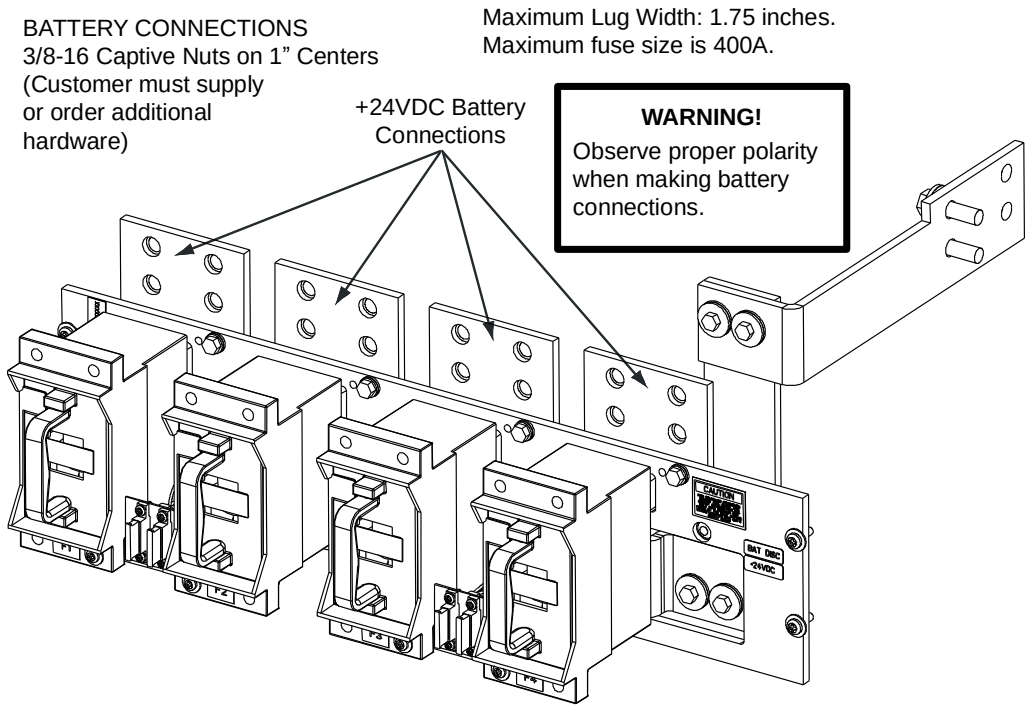
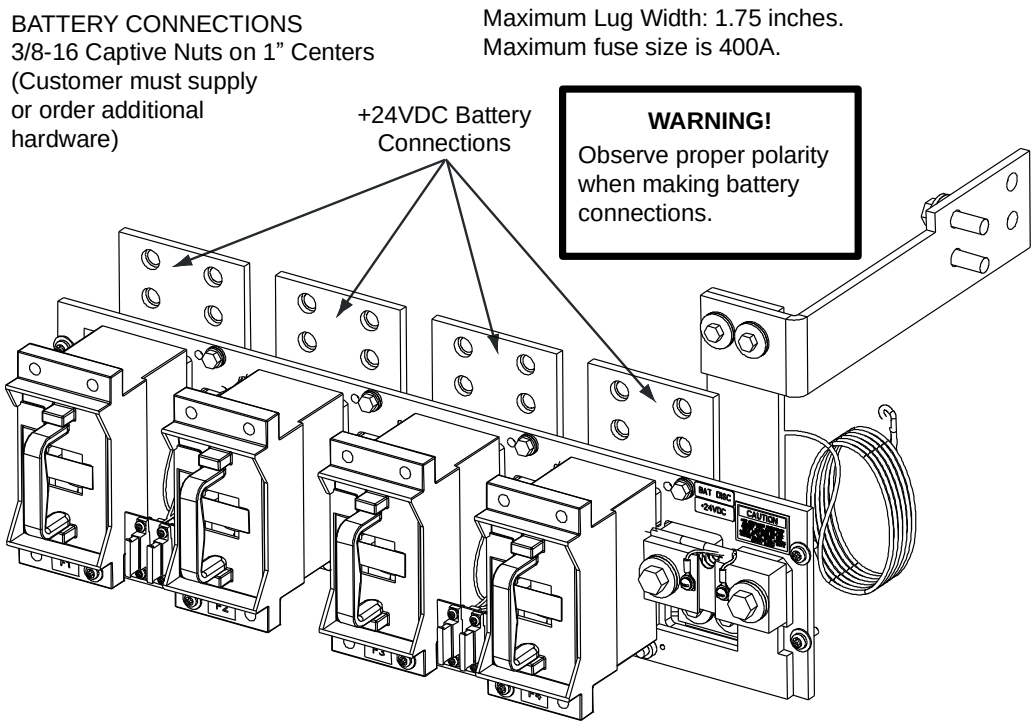
**List BG: Battery Disconnect Distribution Panel,
(4) TPH Fuse Battery Disconnect Positions (without Shunts)
(without Return Busbar)**



**List BH: Battery Disconnect Distribution Panel,
(4) TPH Fuse Battery Disconnect Positions (with Shunts)
(without Return Busbar)**



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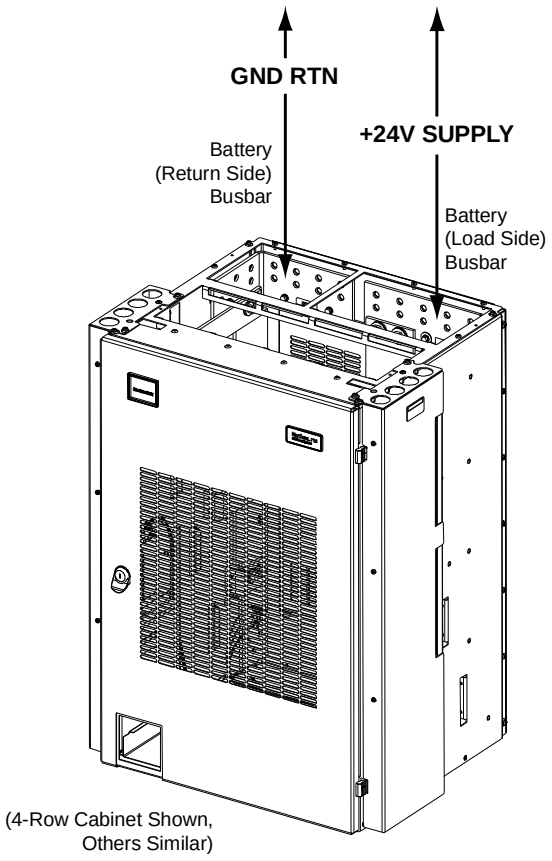
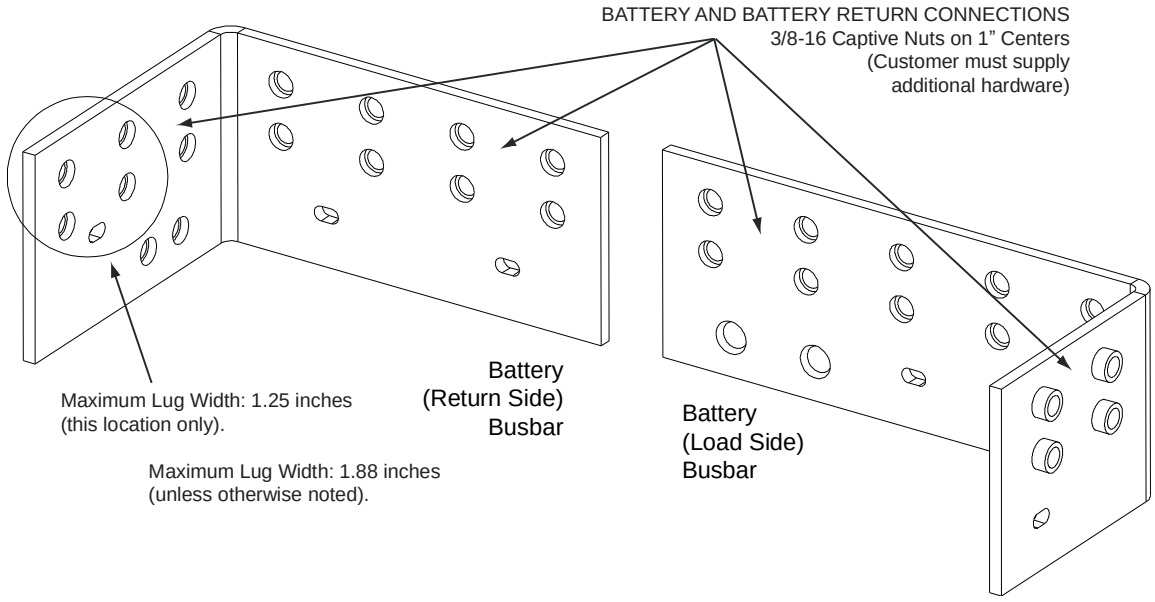
Battery Connections to Distribution Cabinet Battery Busbars

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

Battery may be connected to the battery busbars located in the distribution cabinet, as detailed in this section, depending on site requirements.





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Battery Connections to Optional Battery Landing Busbar Kit P/N 541371

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

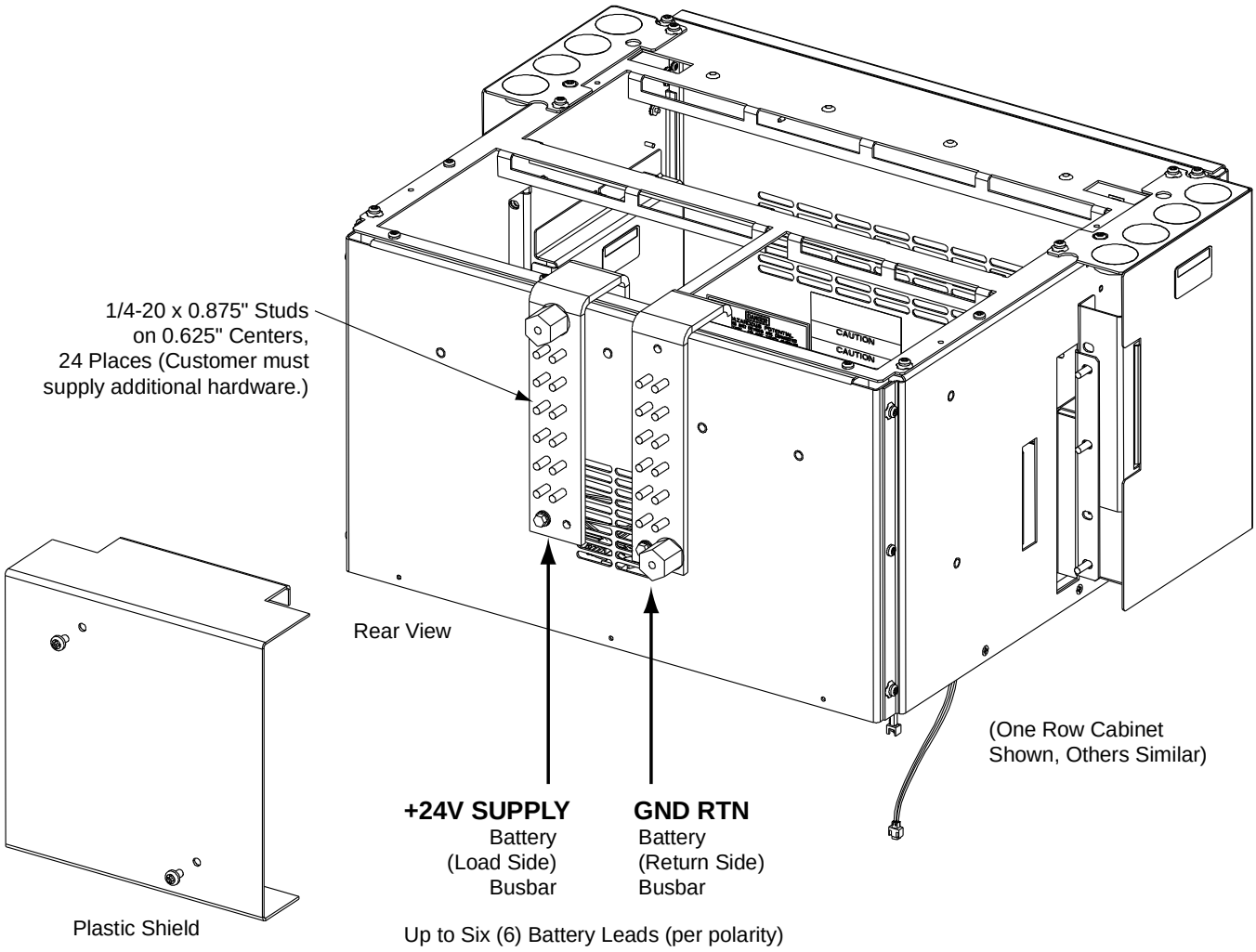

Figure 4-13
Battery Connections to Optional Battery Landing Busbar Kit P/N 541371

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Battery Connections to Optional Battery Landing Busbar Kit P/N 550265

Danger: Adhere to the "Important Safety Instructions" presented at the front of this document.

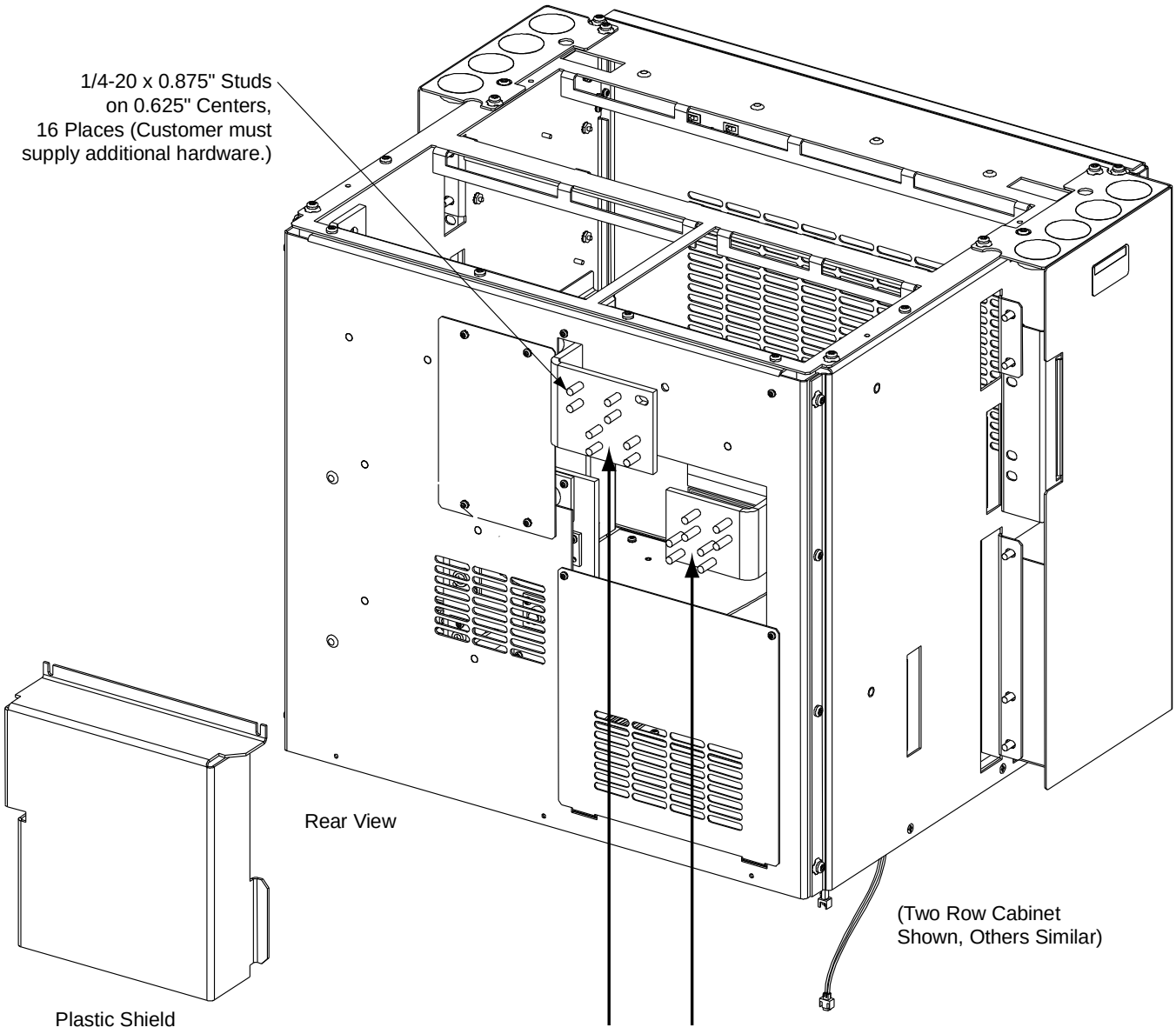

Figure 4-14
Battery Connections to Optional Battery Landing Busbar Kit P/N 550265

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INSTALLING AND CONNECTING BATTERIES IN LIST 93 BATTERY TRAY (IF FURNISHED)

Important Safety Instructions

Danger: THIS EQUIPMENT IS USED IN CONJUNCTION WITH LEAD-ACID BATTERIES. WORKING NEAR LEAD-ACID BATTERIES IS DANGEROUS!

- ***Batteries contain sulfuric acid.***
- ***Batteries may generate explosive gases.***
- ***Batteries are an energy source that can produce high amounts of electrical current.***

FOR THESE REASONS, IT IS OF CRITICAL IMPORTANCE THAT YOU READ THESE INSTRUCTIONS AND FOLLOW THEM EXACTLY.

WHEN WORKING WITH LEAD-ACID BATTERIES:

- ***Wear complete protection for eyes, face, hands, and clothing. Examples are safety goggles or face shield, a rubber apron, and gloves.***
- ***If battery acid enters your eye, immediately flush your eye with running cold water for at least 15 minutes. Get medical attention immediately.***
- ***If battery acid contacts skin or clothing, wash immediately with soap and water.***
- ***NEVER smoke or allow a flame or spark near batteries.***
- ***NEVER allow a metal object, such as a tool, to contact more than one terminal of a battery at a time, or to simultaneously contact a terminal and a grounded object (such as the battery enclosure). Even a momentary short circuit can cause sparking or explosion. To avoid such short circuits:***
  - ***Remove watches, bracelets and rings.***
  - ***Use only tools having insulated handles.***
  - ***If insulated tools are not available, completely cover tool handles with a minimum of three half-lapped layers of vinyl electrical tape.***
  - ***Ensure that wrenches with more than one working end have only one end exposed.***
- ***Always follow the battery manufacturer's recommendations and admonishments.***

Battery Manufacturer Information

Refer to System Application Guide SAG581127000 for specifications and manufacturers of the batteries to be installed in this power system.

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Installing Battery Landing Busbar Kit P/N 541371 (List 21) or 550265 (List 22, 23, or 24)

If the battery tray(s) was ordered with the system, these kits were installed at the factory. If a battery tray is installed in the field, customer must install the kit.

Procedure

1) Refer to Figure 4-15 or Figure 4-16 and install the Battery Landing Busbar Kit.

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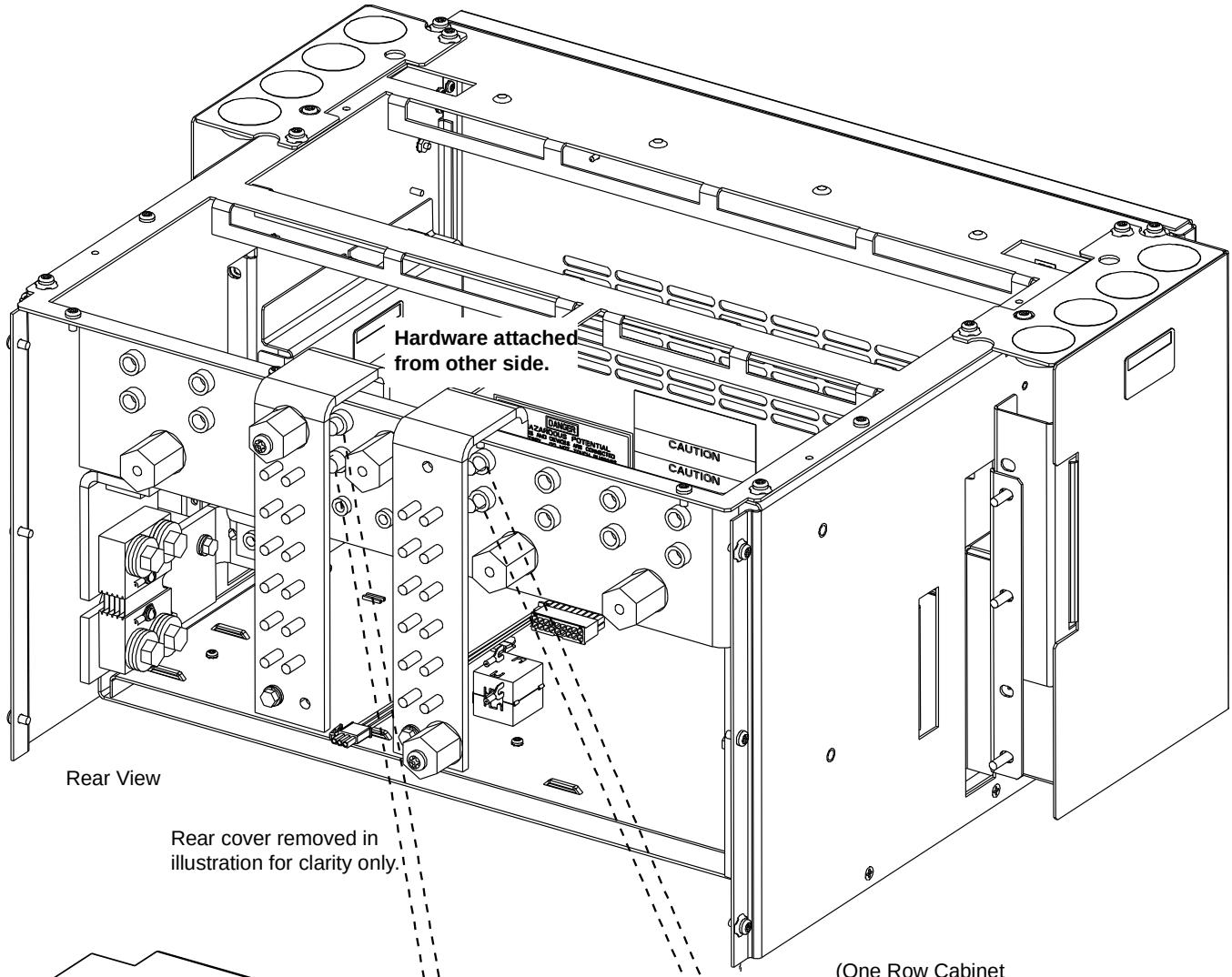

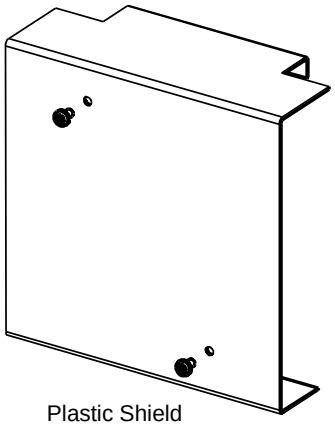

Plastic Shield

+24V Angle Bracket
Secure 2 places
with (in order listed)
3/8-16 x 1-1/4" Bolt,
3/8" Belleville Lockwasher,
and 3/8" Flat Washer.
Torque to 180 in-lbs.

Return Angle Bracket
Secure 2 places
with (in order listed)
3/8-16 x 1-1/4" Bolt,
3/8" Belleville Lockwasher,
and 3/8" Flat Washer.
Torque to 180 in-lbs.

Apply electrical anti-oxidizing compound to busbar mating surfaces.

Figure 4-15
Battery Landing Busbar Kit P/N 541371

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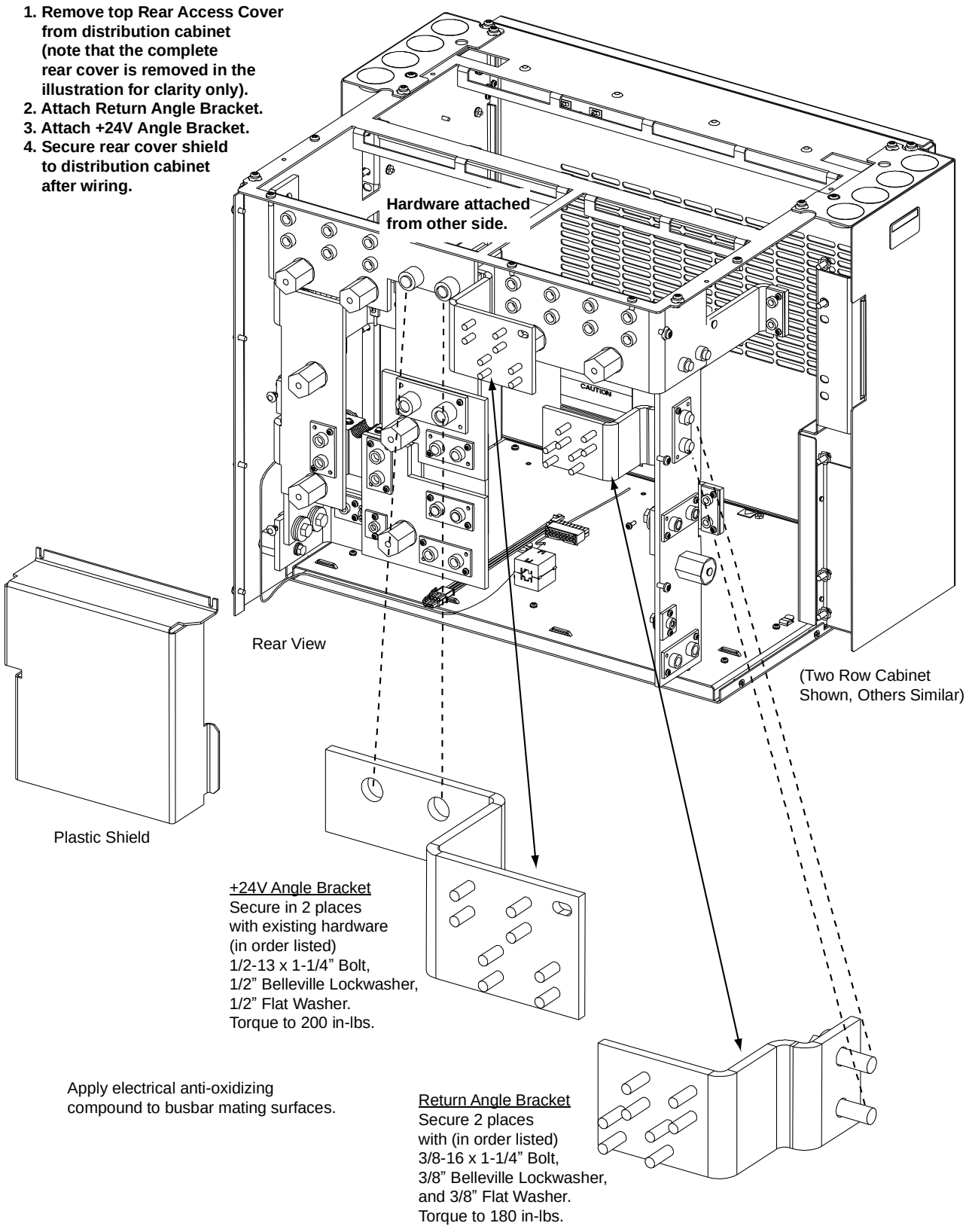
1. Remove top Rear Access Cover from distribution cabinet (note that the complete rear cover is removed in the illustration for clarity only).
2. Attach Return Angle Bracket.
3. Attach +24V Angle Bracket.
4. Secure rear cover shield to distribution cabinet after wiring.
Hardware attached from other side.
Rear View
(Two Row Cabinet Shown, Others Similar)
Plastic Shield
+24V Angle Bracket
Secure in 2 places with existing hardware (in order listed)
1/2-13 x 1-1/4" Bolt,
1/2" Belleville Lockwasher,
1/2" Flat Washer.
Torque to 200 in-lbs.
Apply electrical anti-oxidizing compound to busbar mating surfaces.
Return Angle Bracket
Secure 2 places with (in order listed)
3/8-16 x 1-1/4" Bolt,
3/8" Belleville Lockwasher,
and 3/8" Flat Washer.
Torque to 180 in-lbs.

Figure 4-16
Battery Landing Busbar Kit P/N 550265

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Wiring to the Battery Tray

If the battery tray(s) was ordered with the system, wiring to the battery tray was performed at the factory. If a battery tray is installed in the field, customer must wire to the battery tray.

Procedure

1) Refer to the wiring diagram provided in Figure 4-17, and wire the battery tray for your application. Refer also to Figure 4-13 or Figure 4-14.

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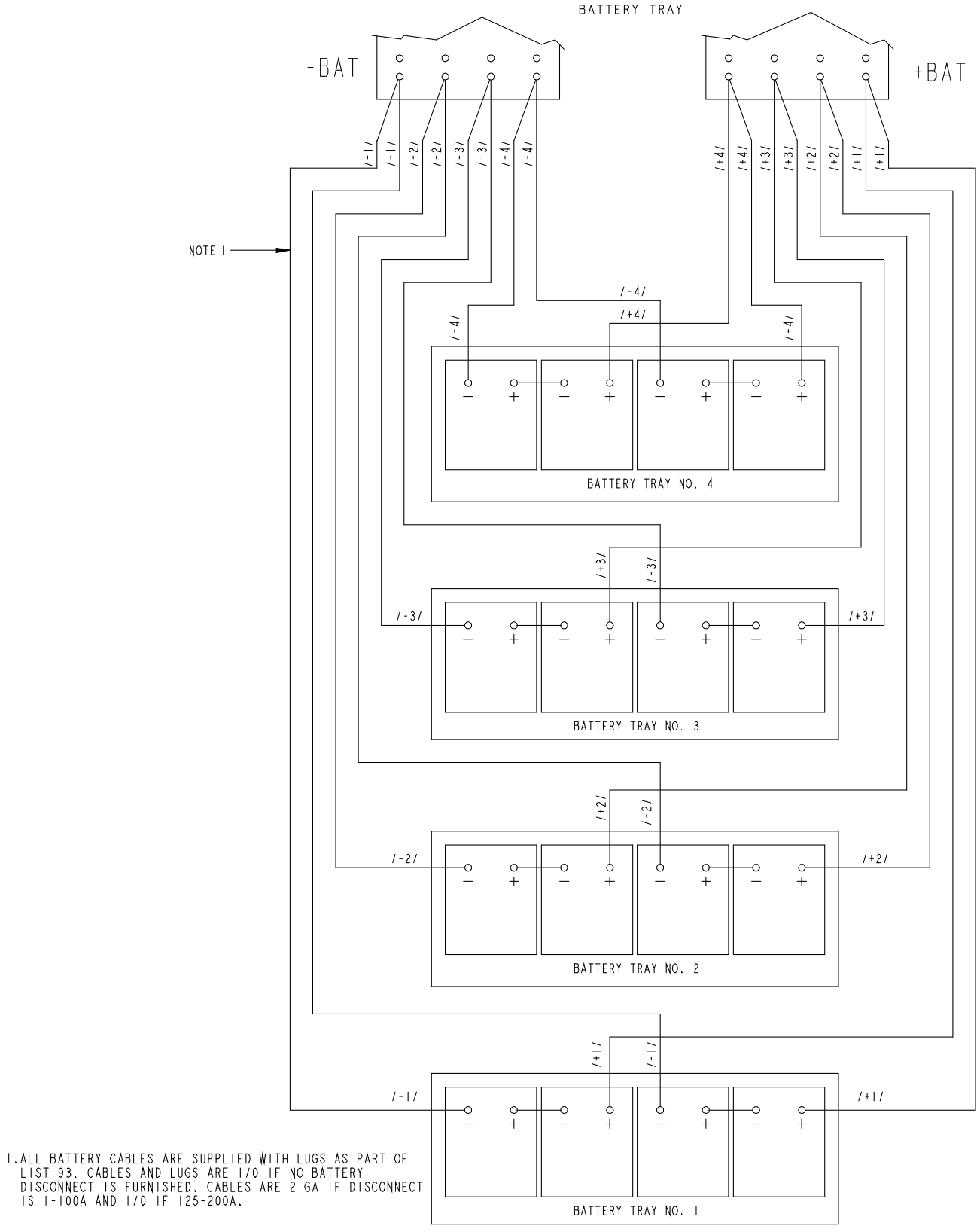

Figure 4-17 (cont'd on next page)
Wiring Diagram - List 93 Battery Tray

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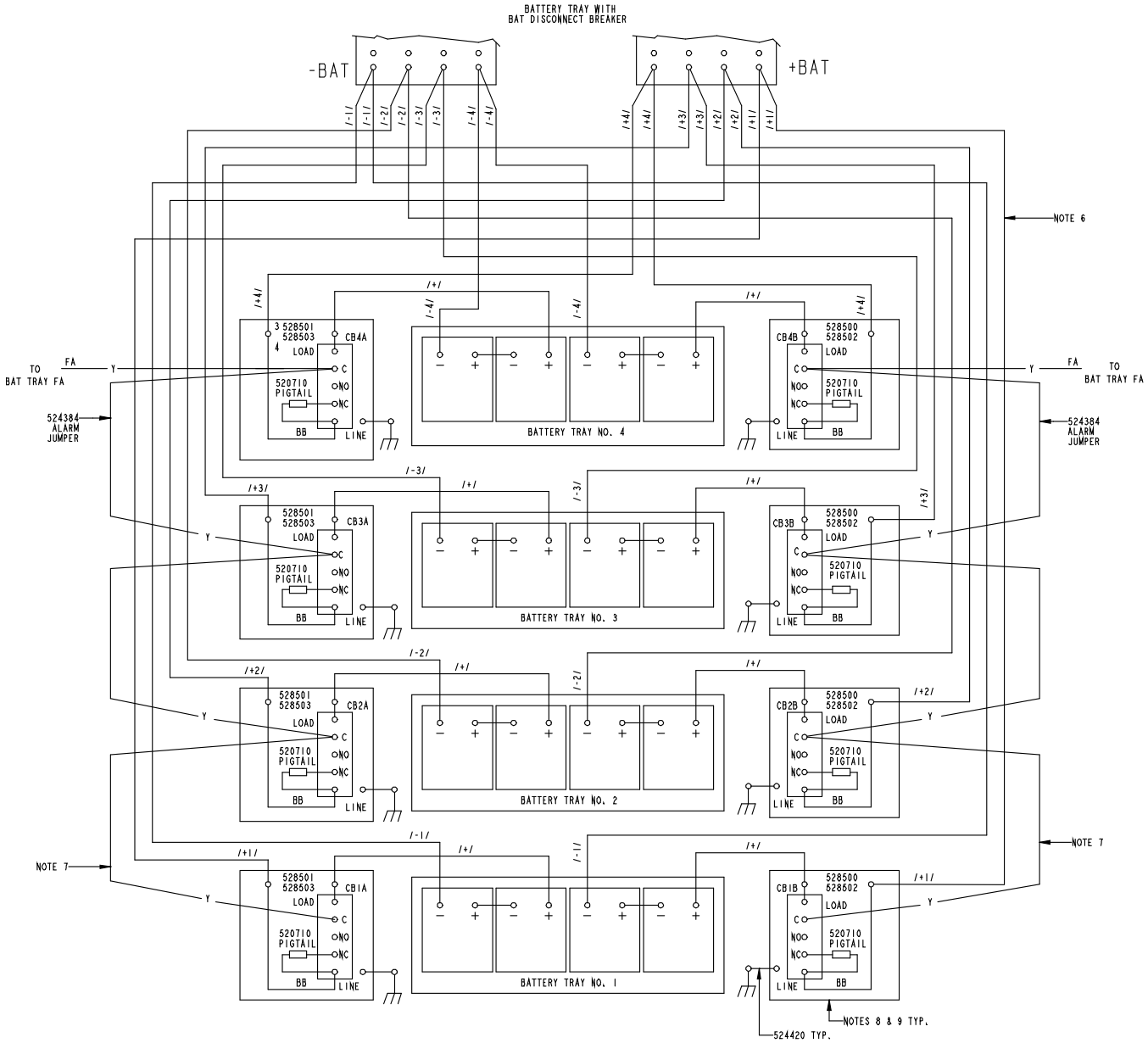

6. ALL BATTERY CABLES ARE SUPPLIED WITH LUGS AS PART OF LIST 93. CABLES AND LUGS ARE 1/0 IF NO BATTERY DISCONNECT IS FURNISHED. CABLES ARE 2 GA IF DISCONNECT IS 1-100A AND 1/0 IF 125-200A.

7. INSULATE AND TY-RAP ANY UNUSED WIRES.

8. BREAKER PANELS 524387 AND 524392 ARE TO BE USED FOR 0-100 AMP 1 POLE }APPLICATIONS.

9. BREAKER PANELS 524383 AND 524391 ARE TO BE USED FOR 125-200 AMP 2 }POLE APPLICATIONS.

Figure 4-17 (cont'd from previous page)
Wiring Diagram - List 93 Battery Tray

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Installing and Connecting Batteries

Procedure

Note: *Refer to Figure 4-18 as this procedure is performed.*

1) **If Battery Trays are Equipped With Circuit Breakers**: Turn OFF the Battery Disconnect circuit breakers located on all battery trays. Refer to Figure 4-18 for locations.

2) Remove the battery retention bracket as shown in Figure 4-18. To do so, remove the four 1/4-20 x 5/8" bolts and associated washers.

3) Slide batteries into the tray, with the battery terminals toward the front as shown in Figure 4-18. Slide batteries into the tray as far as they will go.

Note: *The battery retention bracket can be oriented two ways to accommodate batteries of different lengths. A correctly oriented bracket will fit snuggly against the batteries. If your batteries require the alternate bracket orientation shown in Detail A of Figure 4-18, remove and reinstall the bullet-shaped spacers as shown in Detail A before performing the next step.*

4) Reinstall the battery retention bracket. The spacers on the bracket should separate the batteries from each other. Secure with the hardware removed in a previous step. Refer to Figure 4-18 for washer location.

5) Connect two links supplied by the battery manufacturer between pairs of battery terminals as shown in Figure 4-18. Use hardware furnished by the battery manufacturer. Torque hardware to battery manufacturer's recommendations.

6) Ensure the battery cable ends in all trays are insulated with sleeving before performing the next step.

Danger: In multiple-tray installations, when batteries in one tray are connected, the battery cables in all trays will be energized. Remove sleeving from and connect one cable at a time. Do not allow a cable end to contact the battery tray or equipment rack.

Warning: In the next step, observe correct polarity. Connect only cables labeled "+" to battery terminals labeled "+". Likewise, connect only cables labeled "–" to battery terminals labeled "–".

7) Connect the cables found in the battery tray to the battery terminals, "+" to "+" and "–" to "–". Observe correct polarity. Refer to Figure 4-18. Secure with hardware furnished with the battery. Torque hardware to battery manufacturer's recommendations.

8) Repeat steps 1 through 7 for any remaining battery trays.

9) **If Battery Trays Are Equipped With Circuit Breakers**: To connect the batteries to the power system, turn ON the Battery Disconnect circuit breakers located on all battery trays.

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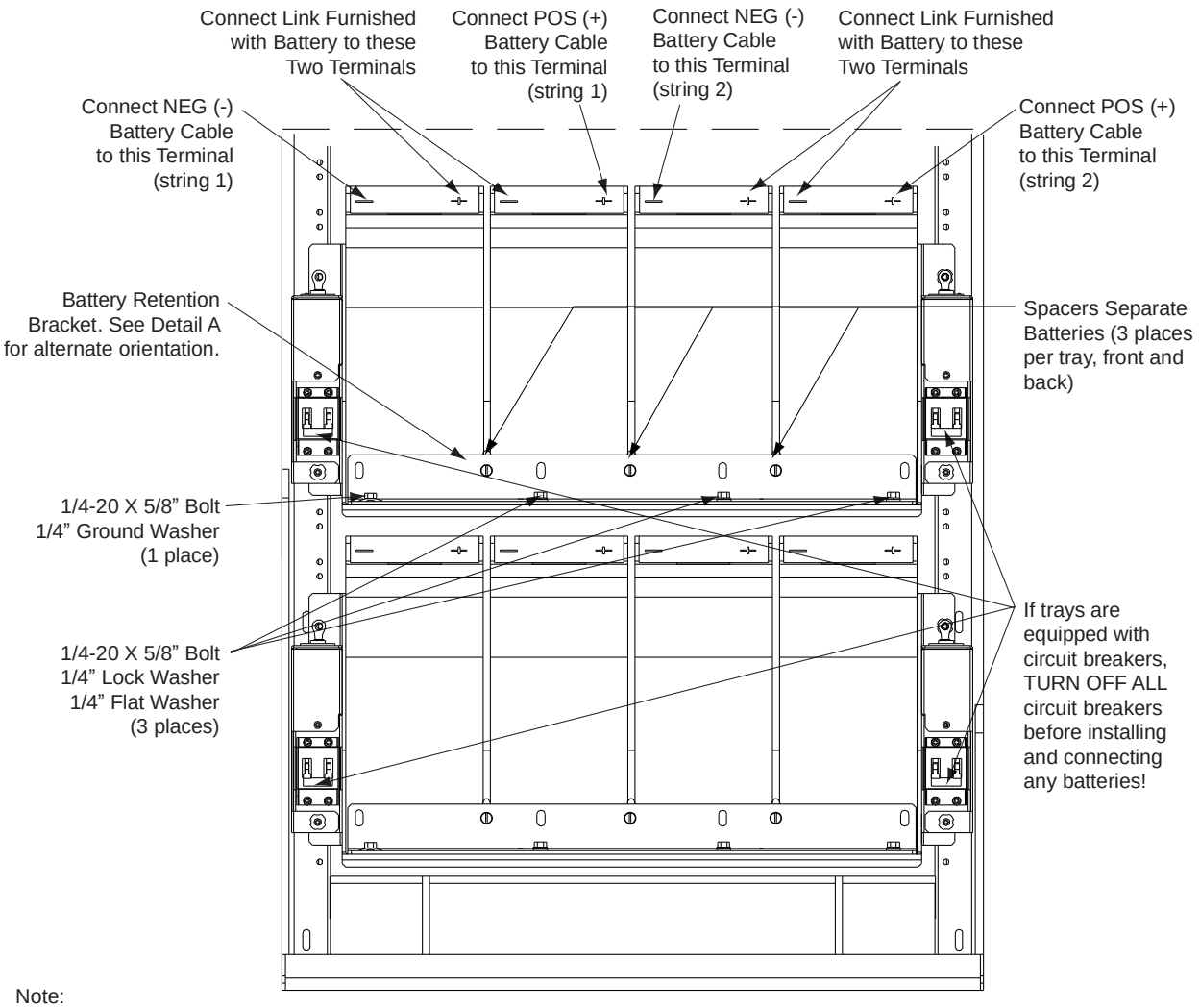
Connect Link Furnished with Battery to these Two Terminals
Connect POS (+) Battery Cable to this Terminal (string 1)
Connect NEG (-) Battery Cable to this Terminal (string 2)
Connect Link Furnished with Battery to these Two Terminals
Connect NEG (-) Battery Cable to this Terminal (string 1)
Connect POS (+) Battery Cable to this Terminal (string 2)
Battery Retention Bracket. See Detail A for alternate orientation.
Spacers Separate Batteries (3 places per tray, front and back)
1/4-20 X 5/8" Bolt 1/4" Ground Washer (1 place)
1/4-20 X 5/8" Bolt 1/4" Lock Washer 1/4" Flat Washer (3 places)
If trays are equipped with circuit breakers, TURN OFF ALL circuit breakers before installing and connecting any batteries!

Note:
1. Two trays shown as example.
2. Cabling detail omitted.

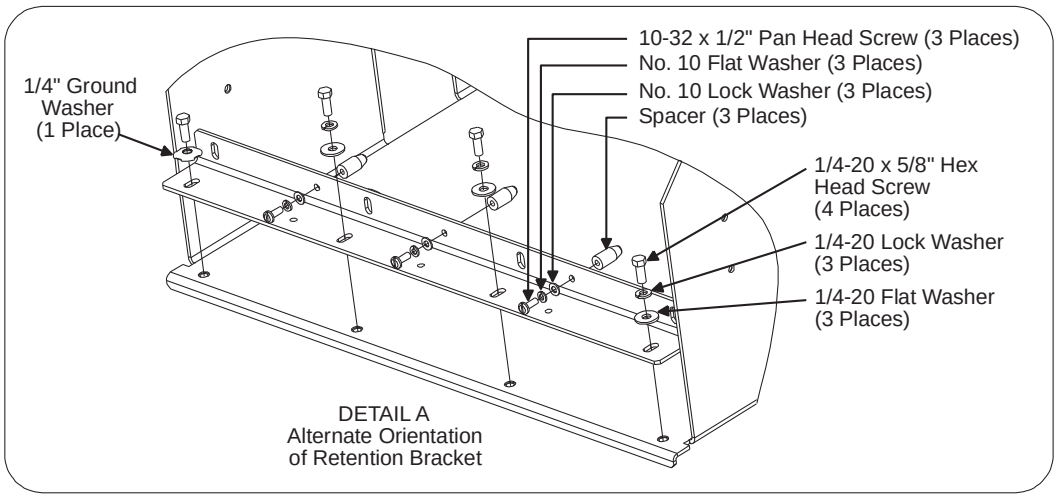
10-32 x 1/2" Pan Head Screw (3 Places)
No. 10 Flat Washer (3 Places)
No. 10 Lock Washer (3 Places)
Spacer (3 Places)
1/4" Ground Washer (1 Place)
1/4-20 x 5/8" Hex Head Screw (4 Places)
1/4-20 Lock Washer (3 Places)
1/4-20 Flat Washer (3 Places)
DETAIL A
Alternate Orientation of Retention Bracket

Figure 4-18
List 93 Battery Tray Battery Installation Details

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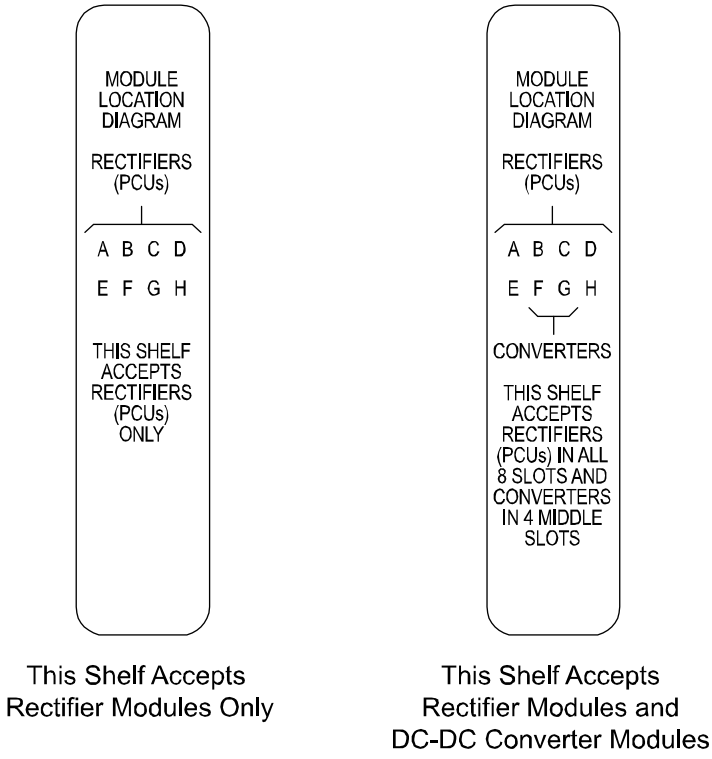
CHAPTER 5. INSTALLING THE MODULES AND INITIALLY STARTING THE SYSTEM

INSTALLING THE RECTIFIER AND DC-DC CONVERTER MODULES

The module location diagram on the front of each shelf shows which type modules can be operated in that shelf. (See Figure 5-1.) Rectifiers will operate in any mounting position in any shelf. If a shelf accepts DC-DC converter modules, they must be installed in any or all of the four middle mounting positions.


MODULE LOCATION DIAGRAM
RECTIFIERS (PCUs)
A B C D
E F G H
THIS SHELF ACCEPTS RECTIFIERS (PCUs) ONLY
MODULE LOCATION DIAGRAM
RECTIFIERS (PCUs)
A B C D
E F G H
CONVERTERS
THIS SHELF ACCEPTS RECTIFIERS (PCUs) IN ALL 8 SLOTS AND CONVERTERS IN 4 MIDDLE SLOTS

This Shelf Accepts Rectifier Modules Only

This Shelf Accepts Rectifier Modules and DC-DC Converter Modules

Figure 5-1
Module Location Diagrams (on the front of each shelf)

Note: *Each rectifier and DC-DC converter module locks into the module mounting assembly by means of a latch located on the right-hand side of the module. The latch and module handle are interactive. Pushing the handle into the module front panel causes the latch to extend to the locking position; pulling the handle out from the module front panel causes the latch to retract. See Figure 5-2 for handle operation.*

Warning: ***To prevent damage to the latching mechanism, ensure the handle is in the open position when installing or removing a module. NEVER hold the handle in the closed position when installing a module into a shelf.***

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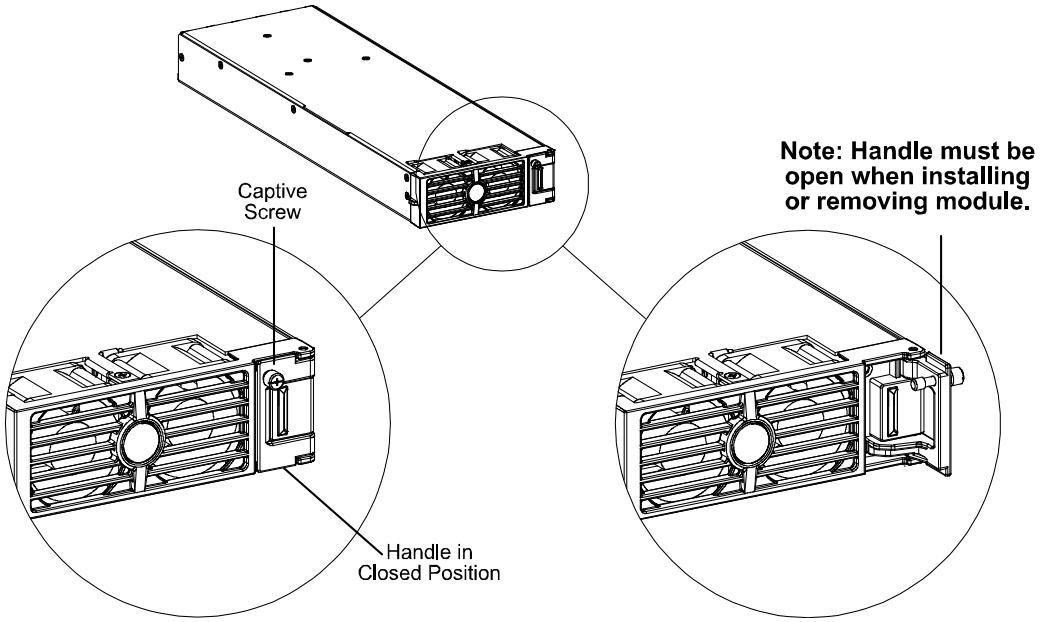

Figure 5-2
Handle/Latch Operation on the Rectifier and DC-DC Converter Modules

Procedure

1) Unpack the modules.
2) Note the model number located on the handle of each module. Model numbers starting with the letter “R” (R24-2500 or 24-3000) are rectifiers. Model numbers starting with the letter “C” (C24/48-1500) are DC-DC converter modules.
3) Check the module location diagram on the front of the shelf to determine which type of module (rectifier or DC-DC converter) can be installed in each mounting position. See Figure 5-1.
4) If present, remove blank cover panels from the mounting positions into which rectifier or DC-DC converter modules are to be installed.
5) Place the module into an unoccupied mounting slot without sliding it in completely.
6) Loosen the captive screw on the module handle. Pull the handle to pivot it out of the module front panel (this will also retract the latch mechanism located at the right side of the module). See Figure 5-2.
7) Push the module completely into the shelf.
8) Push the handle into the front panel of the module. This will lock the module securely to the shelf. Tighten the captive screw on the handle.
9) Repeat the above steps for each module being installed in the system.
10) After the modules are physically installed in the mounting shelf(s), they are ready for operation immediately after power is supplied to them.

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INITIALLY STARTING, CONFIGURING, AND CHECKING SYSTEM OPERATION

Important Safety Instructions

Caution: Performing various steps in the following procedures may cause a service interruption and/or result in the extension of alarms. Notify any appropriate personnel before starting these procedures. Also, notify personnel when these procedures are completed.

Initial Startup Preparation

- Ensure that all blocks for Chapters 2 through 4 in the *Installation Acceptance Checklist*, located in Chapter 1, have been checked.
- Ensure that module mounting positions are filled by a rectifier module, DC-DC converter module, or a blank cover panel as desired. It is acceptable for positions to be left vacant.
- Refer to the configuration drawing (C-drawing) supplied with your power system documentation for factory settings of adjustable parameters.

Initially Starting the System

Procedure

1) Apply DC input power to the system by closing the external DC disconnect(s) or protective device(s) that supplies battery power to the system, if furnished. Close the system's internal battery disconnect circuit breakers, if furnished.
2) Apply AC input power to the system by closing ALL external AC disconnects or protective devices that supply AC power to the module mounting shelves. Rectifiers and converters (if furnished) automatically start.
3) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.
4) Place each distribution circuit breaker (if furnished) to the ON position.

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ACU+ Controller Initialization

Refer to the ACU+ User Instructions (UM1M820BNA) for detailed instructions.

Refer to Figure 5-3 for locations of the ACU+ local indicators and navigation keys.

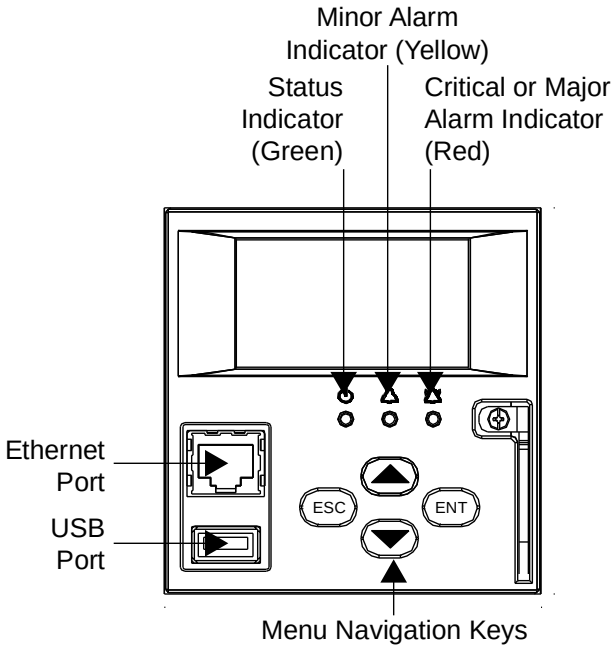


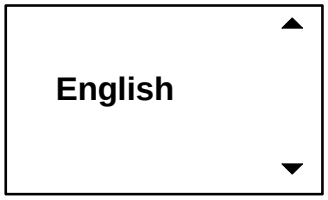
Figure 5-3
ACU+ Local Indicators and Navigation Keys

Procedure

Note: *The initialization routine takes several minutes. During that time various alarm indicators may illuminate on the ACU+ front panel and an audible alarm may sound. Disregard all alarms. An audible alarm can be silenced at any time by momentarily depressing the **ENT** key on the ACU+ Controller.*

1) After the ACU+ is powered on, the display alternates between the "**Emerson Network Power**" screen and a screen displaying "**Advanced Control Unit Plus Version ***** Starting…**.

2) Next, the language screen appears.



Press the up or down arrow key to select the desired language. Press the **ENT** key to confirm the selection. If no key is pressed within 10 seconds, the ACU+ selects the displayed language automatically.

3) As initialization continues, the Main screen is displayed, but with zero volts. Initialization is not complete.

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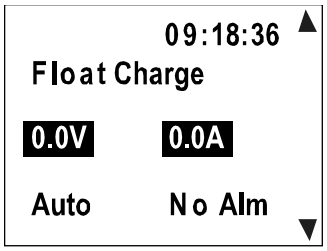
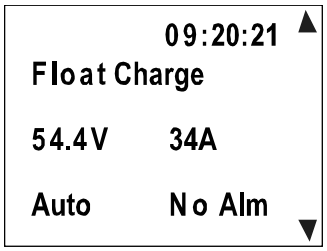
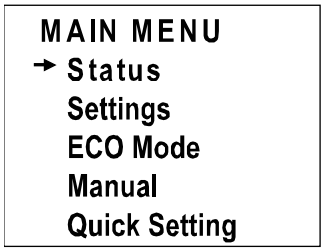


4) When initialization is complete, the Main screen displays voltage and current normally, and no alarms are active.



5) System information is displayed in multiple screens. Repetitively press the up or down arrow key to view other system information screens one by one.

6) From the Main screen, press **ENT** to go to the "Main Menu" screen.



7) From the Main Menu, select a submenu by repetitively pressing the up or down arrow key. The selected submenu will be indicated by the cursor. Press **ENT** to open the submenu.

Note: *Repeatedly press the "ESC" key to return in reverse order level by level from any submenu until the Main screen appears.*

8) Verify and set the ACU+ controller as required for your application. Refer to the ACU+ User Instructions (UM1M820BNA) for procedures. Note that you will have to program the ACU+ for any temperature probes and external inputs/outputs connected to the IB2 Interface Board, optional EIB Interface Board, and optional SM-DU+ Shunt Interface Board.

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Verifying the Configuration File

Your ACU+ was programmed with a configuration file that sets all adjustable parameters. The version number of the configuration file can be found on the configuration drawing (C-drawing) that is supplied with your power system documentation, and on a label located on the ACU+. You can verify that the correct configuration file has been loaded into your ACU+ by performing the following procedure.

Note: *The quantity of LVD's and shunt values for you specific system may be different from the values shown on the C-drawing.*

Procedure

Note: *When viewing any of the following screens, if a key is not depressed within approximately 10 seconds, the ACU+ will automatically return to the Main screen.*

1) With the Main screen displayed, press **ESC**. A screen displays the serial number and software version.
2) Press **ENT**. A screen displays the hardware version and MAC address.
3) Press **ENT**. A screen displays the configuration version number.
4) Press **ESC**, or wait approximately 10 seconds, to return to the Main screen.

Checking Basic System Settings

Navigate through the controller menus and submenus to check system settings. You can adjust any parameter as required.

Procedure

To Select a Sub-Menu:
Press the up or down arrow keys to move the cursor up and down the list of sub-menus in the menu screen (selects the sub-menu), then press **ENT** to enter the selected sub-menu.

To Enter a Password:
If a password screen opens, a password must be entered to allow the User to make adjustments. To enter a password, with the cursor at the User Name field (default is "Admin"), press the down arrow key to move cursor down to the password line. Press **ENT**. "0" is highlighted. Press the up arrow key once to change the "0" to"1" (default password is "1"), then press **ENT** twice. *(**Note:** If you have been assigned a unique User Name and password, follow this procedure to enter these.)*

To Change a Parameter:
Press the up or down arrow keys to move the cursor up and down the list of parameters in the menu screen (selects the parameter to change), then press **ENT** to change the selected parameter. The parameter field highlights. Press the up or down arrow keys to change the parameter value. Press **ENT** to confirm the change.

Note: *Repeatedly press the "ESC" key to return in reverse order level by level from any submenu until the Main screen appears.*

The following table shows the menu navigation for some basic settings. Refer to the separate ACU+ User Manual (UM1M820BNA) supplied with your power system for complete Local Display menus.

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Parameter	Menu Navigation
Date	Main Menu / Settings / Controller / Date
Time	Main Menu / Settings / Controller / Time
Float Voltage	Main Menu / Settings / Battery / Charge / Float Voltage
Equalize Voltage	Main Menu / Settings / Battery / Charge / EQ Voltage
Temperature Compensation Center Temperature	Main Menu / Settings / Battery / Temp Comp / Temp CompCenter
Temperature Compensation Slope	Main Menu / Settings / Battery / Temp Comp / Temp Comp Coeff
Temperature Compensation Sensor	Main Menu / Settings / Battery / Temp Comp / TempComp Sensor
Temperature Compensation Maximum Voltage	Main Menu / Settings / Battery / Temp Comp / Temp Comp Max V
Temperature Compensation Minimum Voltage	Main Menu / Settings / Battery / Temp Comp / Temp Comp Min V
HVSD Limit	Main Menu / Settings / Rectifier / All Rect Set / HVSD Limit
Rectifier Current Limit	Main Menu / Settings / Rectifier / All Rect Set / Curr Limit Pt
Over Voltage Alarm 1	Main Menu / Settings / Power System / General / 24V Over Volt1
Over Voltage Alarm 2	Main Menu / Settings / Power System / General / 24V Over Volt2
Under Voltage Alarm 1	Main Menu / Settings / Power System / General / 24V Under Volt1
Under Voltage Alarm 2	Main Menu / Settings / Power System / General / 24V Under Volt2

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Checking System Status

Procedure

1) Observe the status of the indicators located on the ACU+, rectifiers, and converters (if furnished). If the system is operating normally, the status of these is as shown in Table 5-1.

Component	Indicator		Normal State
ACU+	Status (Green)		On
	Minor (Yellow)		Off
	Critical or Major Alarm (Red)		Off
Rectifier Modules	Power (Green)		On
	Protection (Yellow)		Off
	Alarm (Red)		Off
Converter Modules	Power (Green)		On
	Protection (Yellow)		Off
	Alarm (Red)		Off

Table 5-1
Status and Alarm Indicators

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Changing Battery Capacity Rating in the ACU+

To change the battery capacity setting of the ACU+ to match the battery connected to the power system, perform the following procedure.

Procedure

1) With the Main screen displayed, press **ENT** to go to the Main Menu. Navigate to and select "**Settings**" (ENT).
2) If a password screen opens, a password must be entered to allow the User to make adjustments. If a password was previously entered and has not yet timed out, skip this step and proceed to step 3). Otherwise, to enter a password, with the cursor at the User Name field (default is "Admin"), press the down arrow key to move cursor down to the password line. Press **ENT**. "0" is highlighted. Press the up arrow key once to change the "0" to"1" (default password is "1"), then press **ENT** twice. *(**Note:** If you have been assigned a unique User Name and password, follow this procedure to enter these.)*
3) With the Settings menu screen displayed, navigate to and select "**Battery**" (ENT) / "**Battery 1**" (ENT).
4) Navigate to "**Rated Capacity**". Press **ENT**. Use the up or down keys to adjust the value as required. Press **ENT**.
5) Return to the Main screen by repeatedly pressing **ESC** (escape).

Configuring the ACU+ Identification of Rectifiers and Assigning which Input Phase is Connected to the Rectifiers

When rectifiers are all installed prior to applying power and starting the system, the order in which the ACU+ identifies the rectifiers is by serial number (lowest serial number is Rect 1, next lowest is Rect 2, etc.). If you prefer the ACU+ to identify the rectifiers by position in the system, perform the following procedure.

Upon power up, the ACU+ arbitrarily assigns Phase A, B, or C to each rectifier. This assignment is used to display rectifier AC input phase voltage(s). The User may reassign the phase to each rectifier per your specific installation by following the procedure below.

Procedure

1) With the Main screen displayed, press **ENT** to go to the Main Menu. Navigate to and select "**Settings**" (ENT).
2) If a password screen opens, a password must be entered to allow the User to make adjustments. If a password was previously entered and has not yet timed out, skip this step and proceed to step 3). Otherwise, to enter a password, with the cursor at the User Name field (default is "Admin"), press the down arrow key to move cursor down to the password line. Press **ENT**. "0" is highlighted. Press the up arrow key once to change the "0" to"1" (default password is "1"), then press **ENT** twice. *(**Note:** If you have been assigned a unique User Name and password, follow this procedure to enter these.)*
3) With the Settings menu screen displayed, navigate to and select "**Rectifier**" (ENT).
4) Navigate to "**Rect #**" (**#** is used here to represent the rectifier identification number). Press **ENT**. The rectifier # menu screen is displayed, and the green LED on one rectifier starts flashing. This is the rectifier currently identified by the ACU+ as rectifier #. (If this is not the rectifier you want, press **ESC** to return to rectifier menu screen and select a different rectifier.)

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5) If you wish to change the Rectifier IDs, navigate to and select "**Rectifier ID**". Press **ENT**. Use the up or down keys to change the ACU+ identification number for the flashing rectifier. Press **ENT**.

6) If you wish to change the Rectifier Phase Assignment, navigate to and select "**Rect Phase**". Press **ENT**. Use the up or down keys to change the phase connected to the flashing rectifier. Press **ENT**.

Note: *The new ID and/or phase assignment will not take effect until this entire procedure is completed and the new ID's have been confirmed.*

7) Press **ESC** to return to rectifier menu screen.

8) Navigate to and select the next rectifier.

9) Repeat steps 4) through 8) for each of the remaining rectifiers in the system.

10) When you have finished selecting identification numbers for all rectifiers, repeatedly press **ESC** to return to the Main Menu.

11) Navigate to and select "**Manual**" (ENT) / "**Rectifier**" (ENT) / "**All Rect Ctrl**" (ENT).

12) Navigate to "**Confirm ID/PH**". Press **ENT**. "**Yes**" highlights.

13) Press **ENT** to select the operation. Press **ENT** again to confirm.

Note: *Check you numbering to be sure it is correct. If there where conflicts in your numbering, rectifiers with conflicts will be assigned the next available sequential number.*

14) Return to the Main screen by repeatedly pressing **ESC** (escape).

Configuring the ACU+ Identification of Converter Modules

When converters are all installed prior to applying power and starting the system, the order in which the ACU+ identifies the converters is by serial number (lowest serial number is Conv 1, next lowest is Conv 2, etc.).

If you prefer the ACU+ to identify the converters by position in the system, perform the following procedure.

Procedure

1) With the Main screen displayed, press **ENT** to go to the Main Menu. Navigate to and select "**Settings**" (ENT).

2) If a password screen opens, a password must be entered to allow the User to make adjustments. If a password was previously entered and has not yet timed out, skip this step and proceed to step 3). Otherwise, to enter a password, with the cursor at the User Name field (default is "Admin"), press the down arrow key to move cursor down to the password line. Press **ENT**. "0" is highlighted. Press the up arrow key once to change the "0" to"1" (default password is "1"), then press **ENT** twice. *(**Note:** If you have been assigned a unique User Name and password, follow this procedure to enter these.)*

3) With the Settings menu screen displayed, navigate to and select "**Converter**" (ENT).

4) Navigate to "**Conv #**" (**#** is used here to represent the converter identification number). Press **ENT**. The converter # menu screen is displayed, and the green LED on one converter starts flashing. This is the converter currently identified by the ACU+ as converter #. (If this is not the converter you want, press **ESC** to return to converter menu screen and select a different converter.)

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5) Navigate to and select "**Set Conv ID**". Press **ENT**. Use the up or down keys to change the ACU+ identification number for the flashing converter. Press **ENT**.

6) Press **ESC** to return to converter menu screen.

7) Navigate to and select the next converter.

8) Repeat steps 4) through 7) for each of the remaining converters in the system.

9) When you have finished selecting identification numbers for all converters, repeatedly press **ESC** to return to the Main Menu.

10) Navigate to and select "**Manual**" (ENT) / "**Converter**" (ENT) / "**All Conv Ctrl**" (ENT).

11) Navigate to "**Confirm ID**". Press **ENT**. "**Yes**" highlights.

12) Press **ENT** to select the operation. Press **ENT** again to confirm.

Note: *Check you numbering to be sure it is correct. If there where conflicts in your numbering, converters with conflicts will be assigned the next available sequential number.*

13) Return to the Main screen by repeatedly pressing **ESC** (escape).

ACU+ Alarm Relay Check

The following procedures can be used to verify operation of the external alarm relays in a power system equipped with an ACU+ with the factory default configuration. Note that alarm relays on an ACU+ with a custom configuration may operate differently.

Note: *There are two methods to check alarm relays. The first is by actually causing an alarm. The second is by using the ACU+ alarm relay check function. The first method is used in the following procedures. Refer to the ACU+ User Instructions (UM1M820BNA) for instructions using the ACU+ alarm relay check function.*

Checking the AC Fail Alarm and Battery Discharging Alarm Procedure

Note: *Battery must be connected during this procedure and there must be at least 20A of load.*

1) Verify system is operating and no alarms are present.

2) Verify the ACU+ displays the Main screen. If not, press **ESC** repeatedly to return to the Main screen.

3) Open the external AC disconnects or protective devices that supply power to all of the rectifiers.

   a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement d).

   b) Requirement: "Protection" indicator on all rectifiers goes from off to yellow.

   c) Requirement: ACU+ "Critical/Major" alarm indicator goes from off to red.

   d) Requirement: ACU+ displays "**AC Fail**" and "**Alarm**".

   To see the specific alarm, press **ENT** to display the Main Menu.
   Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
   The Active Alarm screen lists one critical alarm and one minor alarm.
   Note that other alarms may be listed.
   Press **ENT**. "**Batt Group Battery Disch Minor**" is displayed.
   Note that the above alarm is displayed only if
   the system is equipped with a battery shunt.
   Use the arrow keys to scroll through the list of alarms.

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"**Rect AC Mains Failure Critical**" is displayed.
Note that other alarms may be displayed.

e) Requirement: External "Relay 1 Critical Summary Alarm", "Relay 6 Mains Failure Alarm", and "Relay 13 Battery Discharge Alarm" (requires EIB Interface Board to be installed in the system) activate.

4) Return external AC disconnects or protective devices to the ON position. Note that you may get a "Battery Current Limit Exceeded" alarm for a short duration depending on how long this test was performed and the condition of the battery.

a) Requirement: "Power" indicator on all rectifiers goes from off to green.

b) Requirement: ACU+ "Critical/Major" alarm indicator goes from red to off.

c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**No Alm**".

d) Requirement: All external alarms deactivate.

Checking Rectifier Alarm Procedure

1) Verify system is operating and no alarms are present.

2) Verify the ACU+ displays the Main screen. If not, press **ESC** repeatedly to return to the Main screen.

3) Pull one rectifier half way out of the shelf. To do this, first loosen the captive screw on the module handle. Pull the handle to pivot it out of the module front panel (this will also retract the latch mechanism located at the right side of the module). Refer to Figure 5-2 for latch mechanism illustration.

a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).

b) Requirement: ACU+ "Critical/Major" alarm indicator goes from off to red.

c) Requirement: ACU+ displays "**Alarm**".

To see the specific alarm, press **ENT** to display the Main Menu.
Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
The "Active Alarm" screen lists one major alarm.
Press **ENT**. "**Rect ### Comm Fail Major**" is displayed.

d) Requirement: External "Relay 2 Major Summary Alarm" and "Relay 8 Rectifier Major Alarm" activate.

Note: *If the system is equipped with only one rectifier, skip step 4).*

4) Pull a second rectifier half way out of the shelf, as described in Step 3).

a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).

b) Requirement: ACU+ "Critical/Major" alarm indicator stays red.

c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**Alarm**".

To see the specific alarm, press **ENT** to display the Main Menu.
Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
The Active Alarm screen lists one critical and two major alarms.
Press **ENT**. "**Rect Group Multi-Rect Fail Critical**" is displayed.
Use the arrow keys to scroll through the list of alarms.
"**Rect ### Comm Fail Major**" is displayed for each removed rectifier.

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d) Requirement: External "Relay 2 Major Summary Alarm" and "Relay 8 Rectifier Major Alarm" remain active. External "Relay 1 Critical Summary Alarm" and "Relay 11 Rectifier Critical Alarm" (requires EIB Interface Board to be installed in the system) activate.

5) Reinstall the rectifier(s). Refer to *Installing the Rectifiers* at the beginning of this chapter.

a) Requirement: "Power" indicator on subject rectifier(s) goes from off to green.

b) Requirement: ACU+ "Critical/Major" alarm indicator goes from red to off.

c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**No Alm**".

d) Requirement: All external alarms deactivate.

Checking Converter Alarm Procedure

1) Verify system is operating and no alarms are present.

2) Verify the ACU+ displays the Main screen. If not, press **ESC** repeatedly to return to the Main screen.

3) Pull one converter half way out of the shelf. To do this, first loosen the captive screw on the module handle. Pull the handle to pivot it out of the module front panel (this will also retract the latch mechanism located at the right side of the module). Refer to Figure 5-2 for latch mechanism illustration.

a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).

b) Requirement: ACU+ "Critical/Major" alarm indicator goes from off to red.

c) Requirement: ACU+ displays "**Alarm**".

To see the specific alarm, press **ENT** to display the Main Menu.
Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
The "Active Alarm" screen lists one major alarm.
Press **ENT**. "**Conv ### Comm Fail Major**" is displayed.

d) Requirement: External "Relay 2 Major Summary Alarm" and "Relay 10 Converter Major Alarm" (requires EIB Interface Board to be installed in the system) activate.

Note: *If the system is equipped with only one converter, skip step 4).*

4) Pull a second converter half way out of the shelf, as described in Step 3).

a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).

b) Requirement: ACU+ "Critical/Major" alarm indicator stays red.

c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**Alarm**".

To see the specific alarm, press **ENT** to display the Main Menu.
Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
The Active Alarm screen lists one critical and two major alarms.
Press **ENT**. "**Conv Group Multi-Conv Fail Critical**" is displayed.
Use arrow keys to scroll through the list of alarms.
"**Conv ### Comm Fail Major**" is displayed for each removed converter.

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Note that if the system is equipped with only two converters, "AllConvCommFail" is displayed.

d) Requirement: External "Relay 2 Major Summary Alarm" and "Relay 10 Converter Major Alarm" (requires EIB Interface Board to be installed in the system) remain active. External "Relay 1 Critical Summary Alarm" and "Relay 9 Converter Critical Alarm" (requires EIB Interface Board to be installed in the system) activate.

5) Reinstall the converter(s). Refer to the previous procedure *Installing the Converters*.

a) Requirement: "Power" indicator on subject converter(s) goes from off to green.

b) Requirement: ACU+ "Critical/Major" alarm indicator goes from red to off.

c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**No Alm**".

d) Requirement: All external alarms deactivate.

Checking System Under Voltage Alarm 1 and Under Voltage Alarm 2 Procedure

1) Verify system is operating and no alarms are present.

2) Verify the ACU+ displays the Main screen. If not, press **ESC** repeatedly to return to the Main screen.

3) Record the system voltage displayed on the ACU+ Main screen.

4) Press **ENT** to go to the Main Menu. Navigate to and select "**Settings**" (ENT).

5) If a password screen opens, a password must be entered to allow the User to make adjustments. If a password was previously entered and has not yet timed out, skip this step and proceed to step 3). Otherwise, to enter a password, with the cursor at the User Name field (default is "Admin"), press the down arrow key to move cursor down to the password line. Press **ENT**. "0" is highlighted. Press the up arrow key once to change the "0" to"1" (default password is "1"), then press **ENT** twice. *(**Note:** If you have been assigned a unique User Name and password, follow this procedure to enter these.)*

6) With the Settings menu screen displayed, navigate to "**Power System**" (ENT) / "**General**" (ENT) / "**24V Under Volt1**". Record the displayed voltage setpoint.

7) Press **ENT**. Use the up or down arrow keys to adjust the "24V Under Volt1" value to one volt above the system voltage recorded in step 3). Press **ENT**.

a) Requirement: An audible alarm sounds. The alarm will be silenced in Requirement c).

b) Requirement: ACU+ "Critical/Major" alarm indicator goes from off to red.

c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**Alarm**".

To see the specific alarm, press **ENT** to display the Main Menu.
Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
The Active Alarm screen lists one critical alarm.
Press **ENT**. "**Power System 24V Under Volt1 Critical**" is displayed.

d) Requirement: External "Relay 1 Critical Summary Alarm" and "Relay 4 Under Voltage 1 Alarm" activate.

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8) Without readjusting the "24V Under Volt1" setpoint, press the **ESC** key repeatedly to return to the Main Menu. Then navigate as follows: **Settings** (ENT) / "**Power System**" (ENT) / "**General**" (ENT) **/** "**24V Under Volt2**". Record the displayed voltage setpoint.

9) Press **ENT**. Use the up or down arrow keys to adjust the "24V Under Volt2" value to one-half volt above the system voltage recorded in step 3). Press **ENT**.

   a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).

   b) Requirement: ACU+ "Critical/Major" alarm indicator stays red.

   c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**Alarm**".

   To see the specific alarm, press **ENT** to display the Main Menu.
   Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
   The Active Alarm screen lists two critical alarm.
   Press **ENT**. "**Power System 24V Under Volt2 Critical**" is displayed.
   Use arrow keys to scroll through the list of alarms.
   "**Power System 24V Under Volt1 Critical**" is displayed.

   d) Requirement: External "Relay 1 Critical Summary Alarm" and "Relay 4 Under Voltage 1 Alarm" remain active. External "Relay 5 Under Voltage 2 Alarm" activates.

10) Press **ESC** repeatedly to return to the Main Menu. Navigate to "**Settings**" (ENT) / "**Power System**" (ENT) / "**General**" (ENT) / "**24V Under Volt2**".

11) Press **ENT**. Use the up or down arrow keys to adjust the "24V Under Volt2" setting to the value recorded in step 8). Press **ENT**.

12) Use the up or down arrow keys to scroll up to "**24V Under Volt1**".

13) Press **ENT**. Use the up or down arrow keys to adjust the "24V Under Volt1" setting to the value recorded in step 6). Press **ENT**.

   a) Requirement: ACU+ "Critical/Major" alarm indicator goes from red to off.

   b) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**No Alm**".

   c) Requirement: All external alarms deactivate.

Checking System Over Voltage Alarm 1 and Over Voltage Alarm 2 Procedure

1) Verify system is operating and no alarms are present.

2) Verify the ACU+ displays the Main screen. If not, press **ESC** repeatedly to return to the Main screen.

3) Record the system voltage displayed on the ACU+ Main screen.

4) Press **ENT** to go to the Main Menu. Navigate to and select "**Settings**" (ENT).

5) If a password screen opens, a password must be entered to allow the User to make adjustments. If a password was previously entered and has not yet timed out, skip this step and proceed to step 3). Otherwise, to enter a password, with the cursor at the User Name field (default is "Admin"), press the down arrow key to move cursor down to the password line. Press **ENT**. "0" is highlighted. Press the up arrow key once to change the "0" to"1" (default password is "1"), then press **ENT** twice. *(**Note:** If you have been assigned a unique User Name and password, follow this procedure to enter these.)*

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6) With the Settings menu screen displayed, navigate to "**Power System**" (ENT) / "**General**" (ENT) / "**24V Over Volt1**". Record the displayed voltage setpoint.

7) Press **ENT**. Use the up or down arrow keys to adjust the "24V Over Volt1" value to one volt below the system voltage recorded in step 3). Press **ENT**.

   a) Requirement: An audible alarm sounds. The alarm will be silenced in Requirement c).

   b) Requirement: ACU+ "Critical/Major" alarm indicator goes from off to red.

   c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**Alarm**".

   To see the specific alarm, press **ENT** to display the Main Menu.
   Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
   The Active Alarm screen lists one critical alarm.
   Press **ENT**. "**Power System 24V Over Volt1 Critical**" is displayed.

   d) Requirement: External "Relay 1 Critical Summary Alarm" and "Relay 3 Over Voltage 1 Alarm" activate.

8) Without readjusting the "24V Over Volt1" setpoint, press the **ESC** key repeatedly to return to the Main Menu. Then navigate as follows: **Settings** (ENT) / "**Power System**" (ENT) / "**General**" (ENT) / "**24V Over Volt2**". Record the displayed voltage setpoint.

9) Press **ENT**. Use the up or down arrow keys to adjust the "24V Over Volt2" value to one-half volt below the system voltage recorded in step 3). Press **ENT**.

   a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).

   b) Requirement: ACU+ "Critical/Major" alarm indicator stays red.

   c) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**Alarm**".

   To see the specific alarm, press **ENT** to display the Main Menu.
   Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
   The Active Alarm screen lists two critical alarms.
   Press **ENT**. "**Power System 24V Over Volt2 Critical**" is displayed.
   Use arrow keys to scroll through the list of alarms.
   "**Power System 24V Over Volt1 Critical**" is displayed.

   d) Requirement: External "Relay 1 Critical Summary Alarm" and "Relay 3 Over Voltage 1 Alarm" remain active.

10) Press **ESC** repeatedly to return to the Main Menu. Navigate to "**Settings**" (ENT) / "**Power System**" (ENT) / "**General**" (ENT) / "**24V Over Volt2**".

11) Press **ENT**. Use the up or down arrow keys to adjust the "24V Over Volt2" setting to the value recorded in step 8). Press **ENT**.

12) Use the up or down arrow keys to scroll up to "**24V Over Volt1**".

13) Press **ENT**. Use the up or down arrow keys to adjust the "24V Over Volt1" setting to the value recorded in step 6). Press **ENT**.

   a) Requirement: ACU+ "Critical/Major" alarm indicator goes from red to off.

   b) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**No Alm**".

   c) Requirement: All external alarms deactivate.

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Checking Circuit Breaker/Fuse Alarm Procedure

1) Verify system is operating and no alarms are present.
2) Verify the ACU+ displays the Main screen. If not, press **ESC** repeatedly to return to the Main screen.
3) Open the distribution cabinet's front door by turning the latch in the counterclockwise position.

Note: *The following procedure is to be used only with circuit breakers that provide an alarm indication when manually placed to the OFF (open) position (black handle). Electrical trip alarm circuit breakers (white handle) cannot be easily tested in the field.*

4) Do one of the following: (1) Remove a good fuse or a dummy fuse from a GMT fuse position and replace it with a blown fuse, or (2) Remove a good GMT alarm type fuse from a fuse block containing it and replace it with a blown fuse, or (3) Place the handle (if black) of a circuit breaker in the OFF (open) position.
   a) Requirement: An audible alarm sounds. Alarm will be silenced in Requirement c).
   b) Requirement: ACU+ "Critical/Major" alarm indicator goes from off to red.
   c) Requirement: ACU+ displays "**Alarm**".

      To see the specific alarm, press **ENT** to display the Main Menu.
      Navigate as follows: "**Status**" (ENT) / "**Active Alarm**" (ENT).
      The Active Alarm screen lists one critical alarm.
      Press **ENT**. "**DC Fuse Unit Row # FA Critical**" is displayed.

   d) Requirement: External "Relay 1 Critical Summary Alarm" and "Relay 7 Fuse Alarm" activate.
5) Do one of the following: (1) Replace the blown GMT fuse with the fuse removed, or (2) Replace the blown GMT alarm type fuse with the fuse removed, or (3) Place the handle of the circuit breaker in the ON (closed) position.
   a) Requirement: ACU+ "Critical/Major" alarm indicator goes from red to off.
   b) Requirement: Press **ESC** repeatedly to return to the Main screen. ACU+ displays "**No Alm**".
   c) Requirement: All external alarms deactivate.

Checking High 2 Battery Temperature Alarm Procedure

Note: *This procedure requires a battery temperature probe and is performed via the Web Interface.*

1) Verify system is operating and no alarms are present.
2) Via the Web Interface, navigate to Device Information / Battery Group / Status Tab. Record the "IB2 Temp1" temperature reading.
3) Select the Settings tab in the same screen. Record the "IB2 Temp1 High 1" setpoint.
4) Adjust the "IB2 Temp1 High 1" setpoint to 20 degrees below the temperature recorded in step 2).
   a) Requirement: An "IB2 Temp1 High 1" alarm is displayed.
5) From the same screen, record the "IB2 Temp1 High 2" setpoint.

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6) Adjust the “IB2 Temp1 High 2” setpoint to 10 degrees below the temperature recorded in step 2).

   a) Requirement: An “IB2 Temp1 High 2” alarm is displayed.

   b) Requirement: External “Relay 12 High 2 Battery Temperature Alarm” (requires EIB Interface Board to be installed in the system) activates.

7) Using the Web Interface, adjust the “IB2 Temp1 High 2” setting to the value recorded in step 5).

8) Using the Web Interface, adjust the “IB2 Temp1 High 1” setting to the value recorded in step 3).

   a) Requirement: No alarms are displayed on the Web Interface screen.

   b) Requirement: The external alarm deactivates.

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Final Steps

1) If any ACU+ Controller configuration settings were changed, refer to the ACU+ User Instructions (UM1M820BNA) and save a copy of the configuration file. This file can be used to restore the ACU+ Controller settings, if required, at a later date.

   - Note that provided on a USB drive furnished with the system is an ACU+ configuration drawing (C-drawing) and the ACU+ configuration files loaded into the ACU+ as shipped.

2) Close the distribution cabinet's front door. Turn the latch clockwise to secure the door.

3) Verify all rectifier and converter modules and the ACU+ are fully seated, latched, and the latch handle screws secured.

4) Verify there are no external alarms and the local indicators are as shown in Table 5-1.

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REVISION RECORD

Issue	Change Number (ECO)	Description of Change
AA	LLP215523	New
AB	LLP216783	Updated for ACU+ version 3.02.

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